

THE
Institute Review

—For Use In—

COUNTY NORMAL INSTITUTE,

—AND—

By Teachers in Reviewing and Preparing for
an Examination in the Following Branches.

ORTHOGRAPHY, READING, PENMANSHIP, ARITHMETIC,
LANGUAGE, GRAMMAR, GEOGRAPHY, PHYSIOLOGY,
HISTORY, DIDACTICS, CIVIL GOVERNMENT,
BOOK-KEEPING, RHETORIC, ELEMEN-
TARY SCIENCE, AND DRAWING.

PREPARED BY
S. W. HEATH, County Superintendent.
POWESHIEK COUNTY, IOWA.

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PREFACE.

The Author's aim in this Review is to present the essential facts of each subject in the most convenient form for a rapid review, by teachers and Institute classes.

The time of the Institute being very limited, only essentials can receive any attention; and much time is necessary when using outlines, to look up the different facts suggested; and there is usually a failure to sufficiently impress the fact on the mind for want of repetition, the most essential factor of the memory.

Few teachers or pupils master all the essential facts of the different subjects, because the matter is so spread out in text books that it is difficult to condense and select the essentials. Each subject is couched in a few terms, containing the essence of the subject. These terms must be comprehended before much successful work can be done towards mastering the details, or making a practical application of the subject.

The method of reviewing should be to read each statement separately and pause long enough to consider it; as to its meaning and what it includes; as to its position and relation to other parts of the subject; and its relation to the subject as a whole.

Instructors using the Review in Institute classes, should follow the foregoing suggestions in assigning the coming lesson. Teaching should be done when the lesson is being assigned. Never say "take to paragraph so and so for next lesson;" but have the class take what you teach. Have the lesson read and discussed by sentences; assigning such matters to be looked up as may be necessary; but don't fail to call up the questions assigned.

At the beginning of the recitation, key words, which are usually printed in italics in the Review, should be written on the board and members called by name or number to discuss them in their order, without being questioned, as questions suggest answers. This plan will test their knowledge of the subject, and avoid confusion or embarrassment.

Pupils and teachers can answer a great number of questions which they have learned, parrot-like, without much knowledge of the subject.

We have observed during several years' experience in marking teachers and pupils manuscripts, that there are more failures in defining terms of a subject than in any other point. The remedy is plain.

In the preparation of this help we have consulted various authors on each subject and reduced their pages to paragraphs, and paragraphs to sentences; giving only the essential points.

Such as the Review is, it is submitted to teachers and those preparing to teach, with the hope that it may prove of some help in the hands of those willing to follow the suggestions in its use.

AUTHOR.

ORTHOGRAPHY.

Your scholarship is more often judged by your spelling than by any other branch. No subject is more difficult to master. It is largely a matter of memory, and requires concentrated thought. Look at, spell, and write from memory; rewriting misspelled words frequently. In addition to the spelling, study the orthographic terms, sounds, letters, diacritical marks and word analysis.

The following definitions are intended for a short review:

ORTHOGRAPHY is that branch of language, which treats of elementary sounds, letters, syllables, words and spelling.

ORTHOEPY treats of articulate sounds and the pronunciation of words.

ORGANS OF SPEECH are the articulatory, vocal and respiratory.

ELEMENTARY SOUNDS are simple sounds of the voice, used in the formation of spoken words. There are forty-three in the English language, represented by twenty-six letters, called the alphabet. The elementary sounds are divided into vocals, sub-vocals and aspirates.

VOCALS are unobstructed tones of the voice. There are eighteen and are represented by five vowel letters. They are A in *ale*, *at*, *air*, *ask*, *arm*; E in *me*, *met*, *her*; I in *fine*, *it*; O in *old*, *odd*, *or*; U in *use*, *rude*, *up*, *full*.

SUBVOCALS are sounds of the voice, modified by the organs of articulation. There are fifteen in the following key words: *bid*, *did*, *go*, *jug*, *tull*, *man*, *no*, *long*, *run*, *is*, *this*, *vine*, *wet*, *yes*, *vision*.

ASPIRATES are emissions of breath, modified by the organs of articulation. There are ten, represented by consonant letters. The following are the key words: *fine*, *chin*, *hay*, *think*, *kite*, *put*, *it*, *sheep*, *see*, *what*.

A **LETTER** is a character representing an elementary sound. The power of a letter is the sound it represents.

A **VOWEL** is a letter, which represents a vocal sound. There are five regular: a, e, i, o, u, and two irregular, w and y.

A **CONSONANT** is a letter representing subvocal and aspirate sounds. They include all letters not vowels.

SEMIVOWELS represent sounds which may be prolonged without the aid of a vowel. They are f, h, j, l, m, n, r, s, v, z, c and g soft, w, y, th, ch, sh, gh, wh, and ng. The vowel usually precedes in their name.

A **PTHONG** is a letter representing no sound, but modifying the sound of another letter, or in some way distinguishing the word; short to long sound; as e in *fade*, g in *sign*; determines the signification; as w in *wright*, b in *plumb*.

DIPHTHONG is a union of two vowels, sounded or written together in the same syllable; as ou in *our*, oi in *oil* and ow in *now*.

TRIPHTHONG is three vowels in the same syllable: as eau in *beau*, beauty.

DIGRAPH consists of two letters representing a single sound; ea as in *bread*, ch in *church*. They are disjoined when one or more letters come between them: as oe in *home*.

TRIGRAPH is the union of three letters representing a single sound; as ien in *adien*, ght in *might*.

DOUBLE CONSONANTS are two consonant letters together, representing a single elementary sound; as sh in *hash*, ss in *hissing*.

LIQUIDS are consonants, whose sounds readily unite with the sounds of other consonant letters. They are l, m, n, r, and ng.

PROPERTIES OF VOWELS.—1. They generally have their long sounds, when they end on accented syllable, or followed by a consonant and final e silent; as a in *paper*; e in *material*; i in *compliance*; o in *notion*; u in *duty*, *mute*; and y in *fly*.

2. They have their short sound generally, when followed by one or more consonants in the same syllable, except r and sometimes l and s; as a in *pacify*; e in *met*; i in *it*; o in *ox*; u in *dun*; and y in *system*.

3. Vowels have their medial sound when followed by r; as a in *bear*. by ll; as u in *pull*. Italian a before h or r followed by a consonant, as in *farm*.

4. Vowels are obscure when followed by two consonants in the same syllable; a in *clasp*, *pass*; e in *fern*, y in *nymph*.

5. A is broad when followed by ll; as in *ball*; au in *taught*; aw in *law*. O is slender in *to*, oo in *moon*. I is a consonant, when it begins a syllable and is immediately followed by a vowel sounded in the same syllable; as alien, onion.

6. W is a vowel only in combination; as in *cow*, *new*, *view*; it is silent before r in the same syllable; as in *wren*.

PROPERTIES OF THE CONSONANTS.—*Formative Divisions* are Labials or lip sounds; as b, v, w, m, p, f, wh. *Linguo Dentals* or tongue and teeth sounds; as d, th, j, z, t, th, ch, s, sh. *Linguals* or tongue sounds; as l and r; *Linguo nasals*, or tongue and nose sounds, as n; *Palato nasals*; as ng. *Palatals*; as g, y, k, h.

CONSONANTS are the bones of speech and by them we articulate words or join their parts. We utter vowels but articulate consonants. Consonant means sounding with.

SUBSTITUTE is the representation of a sound usually expressed by another letter, or combination of letters; as ei for a in *feint*; i for e in *police*; u for i in *busy*; gh for f in *cough*. There are eighty substitutes in the English alphabet. Thirty-six vowel and forty-four consonant substitutes.

DIACRITICAL MARKS are arbitrary characters, indicating the different peculiar sounds given to letters. They are the Macron, (—) indicating long sounds; Breve, (˘) indicating short sounds; Diæresis, (¨) or dots; Semi-Diæresis (.) or dot; Caret, (^) Tilde (~) or wave; Cedilla (') and Suspended Bar (⏟).

THE MACRON marks long sounds: as *fate*, *mete*, *fine*, *stone*, *fuse*, *my*. Over *g* in *gone*, *oo* in *soon*; across *e* in *can*, *chord*: under *e* in *they*, *n* in *ink*: between *t* and *h* in *then*.

THE BREVE marks short sounds: as *fat*, *let*, *in*, *lot*, *up*, *hymn*. Over *oo* in *shook*.

DIÆRESIS OR DOTS, indicate occasional sounds: over *a* in *far*, *i* in *ma-rine*; under *a* in *ball*, *o* in *do*, and *u* in *rude*.

SEMI-DIÆRESIS or dot, over *a* in *last*, *o* in *son*, *g* in *gem*: under *a* in *what*, *o* in *wolf*, and *u* in *full*.

CEDILLA, indicates the sound of *s*; as under *e* in *chaise* and *cent*.

TILDE, or wave over *e* in *her*, *i* in *bird*, *y* in *myrrh* and *n* in *canon*.

CARET over *a* in *air*, *e* in *there*, *u* in *hurl*, and *o* in *for*.

SUSPENDED BAR under *s* in *is* and *x* in *exist*: giving *x* the sound of *gz*.

WORDS, as to similarity in meaning and spelling, are classed as synonyms and homonyms.

SYNONYMS are words similar in meaning but differing in use; as bring, motion toward the speaker: fetch first from then towards Examples: idle, lazy; industry, diligence; clumsy, awkward, uncouth, etc.

HOMONYMS are words alike in their pronunciation, but differing in their spelling and meaning; as ate and eight; mite and might; blue and blew.

COGNATES are sounds made with the organs in the same position; as *b* and *p*, *v* and *f*, *s* and *z*, *j* and *ch*, *d* and *t*, *g* and *k*.

CONTINUANTS are sounds capable of prolongation; as *b*, *d*, *f*, *j*, etc. Explodents are sounds incapable of prolongation, as *t* and *p*.

LETTERS as to their position are antecedent when they come before; subsequent when they follow; proximate when near; and remote when farther away from the letter they modify.

A SYLLABLE is a word, or part of a word, uttered or written together, consisting of a vowel, or a vowel with consonants affixed. As to position they are ultimate, or last, penult, ante-penult, and pre-ante-penult. The base of the syllable is the vowel. The modifiers are the consonants coming before or after the vowel, and are called antecedent and consequent, proximate and remote modifiers.

A WORD is a spoken or written sign of an idea. They are divided as to their number of syllables into monosyllables, dissyllables, trissyllables, and polysyllables or many syllables. As to form, words are divided into simple and compound. As to origin, into primitive and derivative.

A SIMPLE WORD is one not formed by uniting two or more words: as man, manly.

A COMPOUND WORD is one formed by uniting two or more simple words: as ink-stand, mother-in-law.

A PRIMITIVE WORD is one not formed from any other word in the same language: as man, gain.

A DERIVATIVE WORD is one formed by a prefix or suffix, or some other change: as manly, regain and men.

THE PREFIX is that part placed before the root. The following are the most frequent: ab, from; ad, to; ambi, around; ante, front; anti, against; be, to make; by, near; circum, round; con, together; dis, out of; epi, upon; hemi, half; hypo, less; in, into; inter, between; mis, wrong; non, not; ob, toward; per, through; peri, around; pro, for; sub, under; super, over; trans, across; un, not.

A SUFFIX is that part placed after the root. The following are the most common: ac, al, ar, ary, cal, ile, ine, meaning belonging to; age, ance, ancy, ion, meaning state or act of; t, th, d, ed, is or did; ant, ent, one who; dom, ric, ship, state or territory.

ACCENT is a stress of voice placed on some certain syllable or syllables of a word. Primary is the principal accent. Secondary accent is the less forcible. Discriminative accent is that given words spelled alike to distinguish different parts of speech: as august, grave; August, a month. Other examples are, concert, frequent, compound and accent.

SPELLING is naming or expressing the constituent parts of a word, in their proper order. Oral is by the mouth; Orthographic by letter; Phonic by sound; Phonetic by characters representing the sounds.

Rule 1. F, L or S double, when ending a monosyllable, preceded by a single vowel; as spell, miss, staff.

Rule 2. G ending, preceded by a consonant, change y into i before an additional letter; as try, trial; carry, carried; except in adding ing.

Rule 3. E silent, ending is dropped in adding a vowel suffix; as ing.

Rule 4. L L ending, drop one l before less and ly; but retain when the syllable is accented; awful, unaccented; fulfill, accented.

Rule 5. Double the final consonant before a suffix beginning with a vowel, when the syllable is accented and ends with a single consonant; as begin, beginner; otherwise do not double; as wool, woollen; visit, visiting.

Rule 6. Ei begins words, ie terminates and follows e; as either, reigned; ancient, brief.

SPELLING REFORM urges the spelling of words as they are pronounced; omitting all silent and substitute letters, when useless; as ue in catalogue; me in programme; te in rosette; e in docile, doctrine and granite. Change ed to t in lookt, wisht, mixt, etc. The following words have been endorsed by the Iowa Teachers' Association: hav, giv, liv, ar, hed, thru, tho, catalog, shal, wil, wisht.

CAPITAL LETTERS should begin every sentence, name of the Deity, proper names, titles of honor, name of month, days of the week, the pronoun I and injection O and each line of poetry.

WORD ANALYSIS is separating a word into its constituent parts and describing or giving the properties of each part. Model: Word, simple or compound, primitive or derivative, what syllable, prefixes and suffixes, origin and signification

Example: *Premeditate* is a simple derivative polysyllable, derived from meditor (I muse) and the prefix pre (before), and therefore means to muse or plan before.

ORTHOGRAPHIC PARSING is a separation of a word into its constituent syllables and letters and giving the classification and modification of each. Model: Word described as to form, origin, syllables, meaning; syllables as to base and modifiers, proximate and remote; letters as vowel or consonant, and subclasses. Spell orthographically and phonically. Example: Tin is a simple, primitive monosyllable, signifying a light colored mineral: the base is *i*, a vowel short sound; antecedent modifier is *t*, a consonant aspirate explodent; subsequent modifier is *n*, a consonant subvocal lingua nasal.

PUNCTUATION is the use of certain characters to aid the reader in determining the thought of the writer. Rhetorical punctuation marks the structure of sentences. They are the period (.), interrogation (?), exclamation (!), colon (:), semicolon (;), comma (,), dash (—), brackets ([]), and quotation marks (" ").

THE PERIOD (.) should be placed after every declarative and imperative sentence; abbreviation; before decimals and between dollars and cents; after headings, and letters used as numerals.

INTERROGATION POINT (?) follows every question.

EXCLAMATION POINT (!) follows every exclamation.

COLON (:) follows a clause complete in itself but not concluding the sentence. Be yourself; never imitate. Before a quotation or enumeration of particulars introduced by, as follows.

SEMICOLON (;) is used between parts divided by commas; before *as*, namely, that is, and between a formal enumeration of particulars.

COMMA (,) sets off names of a series; oppositional expressions; words repeated for emphasis; omission of a verb; pairs of words; quotations and when the meaning is thereby made clearer.

DASH (—) indicates a break in the construction.

BRACKETS ([]) enclose words, phrases and clauses explanatory of what precedes.

QUOTATION MARKS (" ") show that the passage was taken verbatim from another.

REFERENTIAL punctuation includes the asterisk, dagger, brace or index hand referring to foot notes, etc.

ETYMOLOGICAL punctuation includes the apostrophe, hyphen, caret, diacritical marks.

METHODS—1. Use a spelling book and dictionary for regular work and require both oral and written work. Pronounce a word but once and have pupils pronounce before spelling.

2. Rule paper or slates and write words in first column, the part of speech in the second, definition or synonym in the third, and use the word in a sentence in the fourth.

3. Use both oral and written work. Oral for creating an interest and for pronunciation. Keep a list of misspelled words for review and have pupils misspelling, to spell the word or write it a number of times.

4. Spelling games: Spell and go up. Choose sides. Each pupil name a letter, then all spell in concert. Spell a word beginning with the last letter of the last word spelled. Spell a word rhyming with the last word spelled. Form words from the letters of a word given; as carpet. Give roots and affixes from which to form words. One side give a word and the opposite side give a synonym, homonym or opposite. Pronouncing contests.

5. Give a daily drill on the sounds and marking of words. Spell by letter and by sound as well as writing the word. Spell geographical names, terms in arithmetic, grammar and other studies. Keep a record of misspelled words and per cents of spelling.

Other methods may be added but the above are the most common.

READING.

READING is the perusal or utterance of written thought. Silent, when perused only and audible, when spoken.

SPEAKING is the utterance of thought without the written language before the eye. *Declaiming* is speaking another's composition. *Oratory* is speaking one's own composition, and is premeditated or extemporaneous.

VOCAL CULTURE is training the organs of speech, for the most effective expression of thought and feeling. It consists in exercises in breathing and uttering elementary sounds, with different degrees of force and loudness.

PRONUNCIATION is the enumeration of the sounds of a word, with correct articulation and accent. Pronounce acoustics, almond, Asia, bouquet, bronchitis, catchup, chamois and debris.

ARTICULATION is the distinct enunciation of the sounds in a word. Articulate tube, osier, troubl'dst, buckl'dst. Sentences: The rain ceaseth; He sells sea shells; Shall she sell sea shells?

PITCH is the degree of tension of the vocal chords, and is low, medium, high and monotone. *Key* is the average pitch to be maintained. Low: "Not a drum was heard, not a funeral note. All sighs were mellowed, all sounds subdued." Medium: "To him who in the love of Nature holds communion with her visible forms, she speaks a various language." High: "To arms! To arms! They come!"

TONE is the quality of voice and should be in harmony with the thought expressed. *Conversational* in unemotional thought; as It was in the morning, at the break of day. *Full tone* indicates joy, courage or exultation; as Ring out, wild bells, to the wild sky. *Calling tone* indicates distance; as Oh, John, John, come here. Charge, Chester, charge! On, Stanley, on!

RATE is the speed with which we read, and may be fast, moderate or slow, according to the nature of the thought. Fast rate: They crush and they crowd; They trample upon the living and the dead. Slow rate: "Slowly and sadly we laid him down."

FORCE is the energy with which we read, and may be weak, medium, strong, varying, explosive or expulsive. Examples: Speak gently. Hark! what is that noise? Rouse, ye Romans! Rouse, ye slaves! Laughing exercise: Ha! ha! ha! ha!

INFLECTION is the sliding of the voice upward or downward. It is called simple, when entirely rising or falling. It is called a slide when applied to a word independently or an entire sentence. Examples: Do you deny that? What? Might Rome have been taken whilst I was consul? Who is so base, that he would be a bondsman? As it was then, so it is now.

THE CIRCUMFLEX is a combination of the rising and falling inflections. Example: You will bring your grammar tomorrow. Read, changing the circumflex from will to your, to grammar and tomorrow. A teacher who uses tobacco, if he does not encourage his pupils to form the habit, will eventually ruin his health and injure his reputation. The general rule for inflection is to be governed by the sense. Incomplete sense requires the rising, while complete sense the falling inflection.

EMPHASIS is special force used in the utterance of certain words or sentences, to express their importance. It is called absolute when naturally important to the meaning. Example: We have not *long* to study. *Relative* emphasis belongs to words placed in contrast with other words; as, I am preparing to *teach* and not to *keep* school. *Cumulative* emphasis; as, I tell you, though *you*, though the **WHOLE WORLD**, though an **ANGEL FROM HEAVEN** were to declare it, I would not believe it. Emphasis may be expressed by an increase of force, by lowering the pitch, by changing the rate, by changing the accent, or by a pause.

STYLE of delivery is that form of modulation, or expression to awaken any particular emotion or passion, or to represent some individual.

provincial or notional peculiarity. The most common forms are the narrative, didactic, persuasive, argumentative, colloquial, humorous and personating or caricaturing style. Irish: Pon me sowl, if it's not your self that I see. Its meself that's afther telling ye the news. Dutch: Der man he killed vashn't killed as vash broved.

TRANSITIONS is a sudden change in the manner of delivery, and generally requires lower pitch, slower rate, and less force. It is used in dialogs, or in personating two or more characters, and wherever there is a change in sentiment.

MODULATION is the variation in tone, pitch, force, emphasis and inflection. Proper modulation is of the greatest importance and requires great flexibility of the powers named.

MONOTONE is a sameness throughout and should be avoided, unless the sentiment of the piece is very grave.

AUTHORS are the writers of the selections and should be studied carefully, as to their time, nationality, style of writings, best known productions and other matters of interest. The following *American* authors should receive special study: Longfellow, Whittier, Bryant, Emerson, Holland, Cary Sisters, Holmes, Lowell, Poe, Carleton, Franklin, Aldrich, Sumner, Beecher, Stowe, Bancroft, Webster, Irving, Hawthorne. *English* authors: Shakespeare, Dickens, Carlyle, Macaulay, Scott, Tennyson, Goldsmith, Bunyan, Byron, Johnson and others.

METHODS.—That method is best which causes pupils to think most and develops most power. Judiciously combine synthetic, word and sentence methods. For beginners, give short but frequent lessons. Teach the sounds of letters with their names. Give frequent drills on force, pitch and inflection. Bring out the meaning of what is read by question. Require pupils to copy lessons to learn to spell, use capitals properly and punctuation. Have pupils tell the lesson story from memory. Read aloud to your class the coming lesson, and explain to them the points to study and how. Teach pupils to combine *a* and *the* with the words they modify; as *a*-man; *the*-book. Each pupil should read so that the entire class can hear every word without looking at the book. In the higher grades much attention should be given to language study in connection with the reading of a selection. Select stories and divide into paragraphs, and give pupils to read. Select local items from newspapers. Divide the class and match one division against the other. Choose sides and when one makes a mistake, be seated. In lower grades have pupils read word about, then by sentences. Call attention to the punctuation marks; their meaning and use; but don't get the idea that a pause must be made for every mark. Don't assign a lesson that pupils cannot comprehend. Don't stop a pupil in the middle of a sentence to correct a mistake. Don't scold the bunglers. Don't allow a mispronounced word to go unnoticed. Don't give beginners too many new words at once.

Don't fail to give special drill to weak voices. Don't allow the sing-song drawl, but encourage the conversational expression.

THE SYNTHETIC METHOD consists in teaching the sound of each letter by what is called "Johnny stories;" or illustrations of similar sounds made by animals. Family names are given to syllables to which letters are prefixed, representing the different members of the family; as the *at* family; the different members being f—at fat; h—at hat and etc. The diacritical marks are called hats. The modifying letters are called door knobs and door keys. See Synthetic Manual for full explanation. By this method the pupil gains a power to solve the pronunciation of new words by himself, which is the foundation of educational progress.

THE WORD METHOD presents the idea as the unit, by associating pictures with words, or by teaching the word as the sign of the idea. Good results have been obtained from this method.

THE SENTENCE METHOD begins by presenting a picture and asking a question, that brings out a sentence in answer, which is then shown the pupil in the printed form to be just what he has stated. He is pleased to see his own thoughts in print. The complete thought is made the unit.

THE A. B. C. METHOD, now obsolete, except by school keepers, consisted in teaching the names of the letters first and afterward learning words by spelling them alphabetically. Pupils learned the words by being told the word over and over after spelling and not by spelling it, as was supposed. It may properly be called the "(sin)thetic" method of the dark ages; as it has been a great hinderance to educational progress.

THE VOICE is the audible expression of the mental and physical characteristics of its possessor; hence its culture is of the greatest importance. He or she who neglects it in connection with each reading lesson, fails to teach reading as it should be taught. Study and train the voice from the very first. Since silent reading, or thought reading, constitutes the most of our reading, much attention should be given to the expression of the thought—read silently.

PENMANSHIP.

PENMANSHIP treats of the theory and art of writing. The essentials are *Legibility*, which may be acquired by giving attention to position, movement and form; *Rapidity*, which may be acquired by practice in movements; *Beauty*, which depends on principles, uniformity, light and shade.

POSITION is the manner of sitting most convenient for writing. The three positions are, front, right and left.

MOVEMENT is the proper control of the muscles of the fingers, fore-arm and whole arm. Finger movement consists in the action of the first and second fingers and thumb, in making the upward and downward strokes. Fore arm movement consists of the action of the fore-arm resting at the elbow. Whole-arm movement is from the shoulder. Combined movement includes all the different movements.

HOLDING PEN between the first and second fingers, crossing the corner of the second finger nail, crossing the first finger forward the knuckle; the thumb touching the holder opposite the joint of the first finger; the top of the holder pointing over the right shoulder; both points of the pen resting squarely on the paper.

FORM includes the lines as to kind, space, angles, connections and principles.

LINE is the path of a moving point. There are two kinds: straight and curved. The straight lines are horizontal, vertical and oblique. The curved lines are right and left.

ANGLE is the space between two lines that meet at a point. Right angle forms a square corner. Acute angle is less than a right angle. Obtuse angle is greater than a right angle. Angles are measured from a circle which is divided into 360 parts or degrees. Quadrant or quarter of a circle is 90 degrees.

SLANT is the number of degrees the line is from the base or horizon line. Main slant is 52 degrees. Connective slant is 30 degrees.

SPACE is the measuring unit. For height it is small *i*; for width, small *u*.

CONNECTIONS are made by short turns, oval turns, and by loops.

OVALS are egg shape. Direct ovals begin at the top and move downward with a left curve, and upward with a right curve. Reversed oval begins at the bottom and moves up with a left curve, and down with a right curve.

PRINCIPLES are the constituent parts of a letter, as 1st, straight line; 2d, right curve; 3d, left curve; 4th, extended loop; 5th, direct oval; 6th reversed oval; and 7th, capital stem. The first four are used in making the small letters.

LETTERS are divided into two classes, small and capital letters. The small letters are divided into short, semi-extended and looped letters. Short letters are one space high; semi-extended two; and looped three spaces high. The short letters are: i, u, w, n, m, v, x, o, a, e, c, r, s. The semi-extended letters are t, d, p, q. The loop letters are, h, k, l, b, j, y, g, z, f.

CAPITAL LETTERS are formed by the 5th, 6th and 7th principles. The 5th principle, or direct oval, includes O, E, D, C. The 6th principle or reversed oval includes X, W, Q, Z, V, U, Y, I, J. The 7th principle or capital stem includes A, N, M, T, F, H, K, S, L, G, P, B, R.

SPACING between letters should be one and a fourth space; between words one and a half space; between sentences, three spaces.

SHADING is broadening the line in writing by increased pressure on the pen. There are five forms: the t shade, the p shade, the l shade, the y shade and oval shade.

ANALYSIS consists in naming the elements of a letter, and giving the order of forming, or writing the letter.

METHODS.—Appliances during the first year should be ruled slate and long slate pencil. Second year, lead pencils and paper should be used. The work of the first years should be copying from the board by imitation without analysis. Analysis should be given to more advanced pupils. Legibility first and rapidity afterwards, are the ends to be reached. Use engraved copy books and practice paper for drilling in form and movement. Use blackboard freely in explaining errors and showing proper form. Go about among the pupils during the writing, correcting their positions in pen-holding and sitting, and encourage them to criticise and correct their own mistakes. As soon as they are old enough to comprehend and appreciate the meaning of the terms, teach the principles and have them analyze the letters. Have pupils write letters on the board to be criticised by others. Don't allow pupils to repeat a fault until it becomes a habit. Teach them to write slowly and carefully at first, as speed can be acquired in time. Rapidity may first be practical on letter, then on words and sentences. Take a specimen frequently and post up in the room to compare and note improvement.

ARITHMETIC.

ARITHMETIC is that branch of mathematics, which treats of numbers and the art of computing by them.

MATHEMATICS is the science of quantity, including number and magnitude.

ALGEBRA is that branch of mathematics, which treats of the relations and properties of numbers, by means of letters and symbols.

GEOMETRY is that branch of mathematics, which treats of the relation of magnitudes.

TRIGONOMETRY is that branch of mathematics which treats of the relations of the sides of angles of triangles with the methods of deducing from given parts, unknown parts. The subject is divided into Analytic, Plane and Spherical Trigonometry

CALCULUS is that branch of mathematics which treats of the ratios of variable quantities.

PRELIMINARY TERMS.—*Axiom* is a self evident truth: as, A whole is

greater than a part. *Theorem* is a truth to be proven; as, The square of the sum of two quantities is equal to the the square of the first, plus twice the product of the first by the second, plus the square of the second. *Problem* is a question proposed for solution. *Solution* is an expressed statement showing how the result is obtained. *Operation* is an illustration of a solution. *Principle* is a fundamental truth. *Rule* is the general direction for solving all problems, of a particular kind. *Formula* is a rule represented by symbols. *Unit* is a term signifying one, or one thing. *Number* is the expression of a definit quantity; abstract when no thing or kind is meant; concrete when the kind of unit is named. *Signs* are characters used to show the relation between numbers. *Figure* is a character used to represent a number. The simple value of a figure is its value when standing alone. It has a local value when standing with other figures.

THE FUNDAMENTAL RULES are, Notation, Numeration, Addition, Subtraction Multiplication and Division.

NOTATION is the art of expressing numbers by words, letters and figures; as five, V, 5.

ARABIC NOTATION expresses numbers by figures. Principles—1. Ten units of any order make one of the next higher. 2. Numbers increase from right to left with a ten fold ratio. 3. Ciphers fill vacant orders.

ORDER is the place a figure occupies; as units, tens, hundreds. Period is a group of three orders, and receives its name from the first order in the group; as units, thousands, millions.

ROMAN NOTATION represents numbers by seven letters; viz. I, V, X, L, C, D, M. Principles—1. Every time a letter is repeated its value is repeated; II. 2. A letter of less value coming before one of greater, the less is taken from the greater; IV. 3. A letter of less value coming after one of greater, the value of the less is added; VI. 4. A letter of less value coming between two of greater, it is taken from the one following; XIV. 5. A line above increases the value a thousand times.

ADDITION is the process of uniting two or more like numbers into one equivalent number. Principles—1. Only like numbers and orders can be added. 2. The sum is the same in whatever order added. 3. The sum is always the same in kind as the numbers added. The numbers to be added are called addends. The number obtained by addition is called the sum or amount. The sign is called plus and means that the numbers between which it is placed are to be added. The sign of equality means that the expressions, between which it is placed, are equal. Rule: Write like orders under each other. Begin at units to add, and add tens to the next higher order. Proof: Divide the numbers into groups, or add columns and write whole amount, and add amounts separately.

SUBTRACTION is the process of finding the difference between numbers of the same kind. *Minuend* is the larger number. *Subtrahend* is the smaller number. *Remainder* is the number showing the difference between the minuend and subtrahend. Principles—1. Both numbers must be of the same kind. 2. The difference and subtrahend must equal the minuend. Proof: Add the difference to the subtrahend. If the sum equals the minuend, the work is correct.

MULTIPLICATION is taking one number as many times as there are units in another, or reducing an expression, by two numbers, to an expression of an equal quantity, by one number, having a decimal ratio. *Multiplicand* is the number to be multiplied. *Multiplier* is the number multiplied by. *Product* is the number obtained by multiplying. The sign is read times. Principles—1. The multiplier is always considered an abstract number. 2. The product is always the same in kind as the multiplicand. Proof: Change the places of the factors. Contractions are short processes, when there are ciphers annexed to either or both factors.

DIVISION is the process of finding how many times one number is contained in another, or finding one of the equal parts of a number. *Dividend* is the number to be divided. *Divisor* is the number, by which to divide. *Quotient* is the result of the division. *Remainder* is that part of the dividend left after dividing. Sign is read divided by. Principles—1. The dividend is the product of the divisor and the quotient. 2. When the dividend and divisor are alike, the quotient is abstract. 3. When the divisor is abstract, the quotient is like the dividend. 4. The remainder is like the dividend. Proof: The dividend equals the product of the quotient by the divisor plus the remainder. The operations are called Long Division when all the work is written, and Short Division when part of the work is performed mentally and not written. Contractions are used when the divisor is a composite number, or has ciphers annexed. (How?)

COMPOUND NUMBERS consist of two or more numbers of different denominations used to express one quantity. They differ from simple numbers in their ratios being irregular. The operations consist of Reduction, Addition, Subtraction, Multiplication and Division. Reduction, consists in changing from a higher to a lower, or lower to a higher denomination, without altering the values.

U. S. MONEY is the circulating medium of exchange, in the United States, established by Congress in 1786, and consists of bronze, nickel, silver and gold coins, and paper currency. The ratio is ten, and the denominations and mills, cents, dimes and dollars. Accounts are kept in dollars, cents and mills. A bill is a written statement of articles, bought or sold, with price, and entire cost.

MEASURE is the process of ascertaining the capacity or extent of anything.

DRY MEASURE is used in measuring grain, vegetables and coal. The denominations are pints, quarts, pecks and bushels. The standard unit is the bushel containing 2150.4 cu. inches; equal to a 13-inch cube, approximately. Peck is $\frac{1}{4}$ of a bushel and contains 8 quarts or $537\frac{1}{2}$ cu. in.; and equals approximately an 8.1 in. cube. The quart is $\frac{1}{2}$ of a peck, containing 2 pints or 67 cu. in.; and equals approximately 4.1 in. cube. The pint is one-half quart, containing $33\frac{1}{2}$ cu. in.; equal to 3.2 in. cube.

LIQUID MEASURE is used for measuring all liquids. The standard unit is the gallon, containing 231 cu. in.; equal to a 6.12 in. cube. The quart contains 57.5 cu. in., equal to a 3.88 in. cube. The pint contains 28.7 cu. in., equal to a 3.06 in. cube. The gill contains 7-17 cu. in., equal to 1.93 in. cube. Approximately the gill equals a 2 in. cube; pint, 3 in.; quart, 4 in.; gallon, 6 in. cube.

LONG MEASURE is used in measuring distance, or length. The denominations are: 12 in., 3 feet, $5\frac{1}{2}$ yds., 320 rods. The standard is the yard. A line is one-twelfth of an inch. Barley corn one-third of an inch. Hand equals 4 in. Span 9 in. Cubit 18 in. Furlong 40 rods. Survey, or measure used in laying out land and roads, consists of 7.92 in. in a link; 100 links in a chain; 80 chains in a mile. Mariners measure used in measuring depth and distance atsea, consists of 3 feet in a fathom, 720 feet in a cable length, 3 miles a league.

SUPERFICIAL OR SURFACE MEASURE is used in estimating the value of surfaces; as land, plastering and paving. A surface has two dimensions: as length and breadth. Area is the product of the dimensions or number of times it contains the measuring unit. The unit of measure is a linear unit square. Rectangle is a surface having four straight sides and four square corners; it is called a square when the sides are equal. Square units and units square, differ in the ratio of the squares; as 3 feet square is three times 3 square feet. Denominations—144 sq. in. one sq. ft.; 9 sq. ft. one sq. yd.; $30\frac{1}{4}$ sq. yds. one sq. rd.; 160 sq. rds. one acre; 640 acres one sq. mile.

SOLID OR CUBIC MEASURE is used in measuring solids or quantities having three dimensions. Cube is a solid, having three equal dimensions, six equal faces, eight square corners, and twelve straight edges. Rectangular solids have three dimensions, equal or differing. Solid contents equal the product of the dimensions. Denominations—1728 cu. in. make a cu. ft.; 27 cu. ft. a cu. yd.; 128 cu. ft. a cord; $24\frac{1}{2}$ cu. ft. a perch.

TIME MEASURE is used in measuring time and is closely related to circular measure. They may be compared by two circles, one fifteen times larger than the other. The larger divided into 360 parts called degrees; the smaller into 24 parts called hours; 15 parts, or degrees of the larger circle will equal one part or hour on the smaller circle. One de-

gree on the larger will equal 4 minutes of time on the smaller. The smaller circle may be marked with a 24-hour dial so that 12 o'clock noon will come at the top, and 12 o'clock midnight, at the bottom: 6 p. m. at the right, and 6 a. m. at the left. In this way the two, so difficult to understand, may be easily compared and explained. The circle is divided into 360 parts called degrees. In latitude 40, one degree is equal to 53 miles. A degree is divided into 60 parts called minutes, equal to 280 rds. A minute into 60 parts called seconds, equal to $4\frac{2}{3}$ rods.

TIME is a measured portion of duration. Day is the time of the rotation of the earth on its axis and consists of 24 hours. Year is the time of the revolution of the earth around the sun and consists of $365\frac{1}{4}$ days. The month originated from the moon changes.

WEIGHT is the measured force of gravitation, and is in proportion to the amount of matter in any given quantity. It is measured by means of scales or balances.

TROY pound is the standard and contains 5760 grains. The grain was originally a grain of wheat, taken from the middle of the head, and would be near $\frac{1}{4}$ inch long by $\frac{1}{8}$ inch wide. To compare the relative value and size as above described, the pwt. (24 gr.) would be represented by a surface 1 in. by $\frac{3}{4}$ in. The ounce (480 gr.) by 15 sq. in., or a surface 3 in. by 5 in. The pound by 13.4 in. square or 180 sq. inches.

APOTHECARIES WEIGHT is used in compounding medicines. The Scruple contains 20 grains and would be represented by a surface of 1 in. by $\frac{5}{8}$. The dram (60 gr.) by 1 in. by $1\frac{1}{8}$ in. The ounce and pound are the same as the Troy.

AVOIRDUPOIS WEIGHT is the commercial weight; the pound containing 7000 grains and compared with Troy and Apothecaries weight is represented by 221 sq. in., or a surface 13.4 by 16.5 inches. The ounce, $437\frac{1}{2}$ gr., would be represented by 13.6 sq. in., or a surface 2.1 in. by 6.5 inches. The dram. (27.3 gr.) equals a surface 1 in. by $\frac{5}{8}$ of an inch. The above weights may be illustrated in a diagram, within the surface of the Avoirdupois pound.

METRIC MEASURE is so named from the meter, the standard unit. It has been legalized by the Congress of the United States, and is in use by scientific men throughout the world. *Meter* is the unit of length, and is .0000001 part of the distance from the equator to the pole; or equal to 39.37 inches. *Ar* is the unit of land measure, and is 10 meters square; equal to 4 sq. rds. *Liter* is the unit of capacity, and is a cubic vessel 1 decimeter in its dimensions, and equal to 1 quart. *Gram* is the unit of weight, and is 1 centimeter in its dimensions and equals $15\frac{1}{2}$ grains. *Stere* is the unit of solids and is 1 meter in its dimensions; equal to $\frac{1}{4}$ of a cord. The ratio of the system is 10. The Greek prefixes are used above the base; and are Dekka, Hekto, Kilo, Myria. The Latin prefixes are used below the base; as deci, centi, and milli. Reduction is performed by

pointing off, or annexing ciphers. There are only twelve words to learn in the whole system and can be learned in two hours by the average pupil, when properly taught.

FACTORING treats of the relation of numbers, as to their component parts and their relation to each other. *Factor* of a number will divide it. *Multiple* of a number will contain it. *Prime* number has no factors. *Composit* number has two or more factors. *Prime factor* is a prime number. Numbers are prime to each other when they have no common factor. *Common Divisor* is one that will divide two or more numbers. *Greatest Common Divisor* is equal to the product of the common prime factors, or a divisor of the difference after division. *Least Common Multiple* will exactly contain each given number and contains all the prime factors of each number and no others. The operations consists of finding prime factors, G. C. D. and L. C. M. of numbers. Factoring is used in shortening operations, by canceling equal factors and in the operations of reducing fractions to lower terms and to common denominator.

FRACTIONS treat of the relation of parts of a unit. *A Fraction* is one or more equal parts of a unit. The *Denominator* indicates the number of parts, into which the unit is divided. The *Numerator* indicates the number of parts taken. The *value* of a fraction is its relation to its unit. The *unit* of the fraction is the thing or things divided. The *fractional unit* is one of the parts taken. As to value, fractions are called proper, when less than 1; improper when more than 1; and mixed, when joined to a whole number. As to form, they are called simple, when single; complex, when there is a fraction in one or both terms; and compound, when a fraction of a fraction. Principles—1. Multiplying the numerator or dividing the denominator multiplies the fraction. 2. Dividing the numerator or multiplying the denominator divides the fraction. 3. Multiplying or dividing both terms by the same number has no effect on the value.

THE OPERATIONS consist: 1. In reducing whole numbers to improper fractions. 2. Mixed numbers to improper fractions. 3. Improper fractions to whole or mixed numbers. 4. Fraction to higher terms. 5. Fraction to lower terms. 6. Fraction to least common denominator. *Addition* consists of finding and adding the common numerators. *Subtraction* consists of finding the difference between the common numerators. *Multiplication* consists of finding the product of the numerators and denominators in their lowest terms. *Division* is finding how many times one fraction is contained in another, by inverting the divisor and multiplying the terms; which is equivalent to reducing to common terms and dividing one numerator by the other. Complex fractions are reduced to simple, by multiplying the extreme terms for a numerator and the mean terms for a denominator.

DECIMAL is an order of fractions having ten or some power of ten for

a denominator. They are written the same as whole numbers, with the period, or decimal point, indicating units place. They decrease from left to right in a ten fold ratio. They are read as whole numbers and given the name of the right hand order. The operations consist in reducing a decimal to a common fraction, by writing the denominator below and reducing to lowest terms. Reducing common to a decimal fraction, by annexing ciphers to the numerator and dividing by the denominator, pointing off as many places, as ciphers annexed. *Addition* and *Subtraction* are the same as in simple numbers; the decimal point being placed under the decimal point column. *Multiplication* of decimals has as many decimal places in the product, as there are places in both factors. *Division* has as many decimal places in the quotient as those in the dividend exceed those in the divisor.

PERCENTAGE embraces the various operations, in which 100 is considered the base. *Base* is the number or quantity, on which per cent is estimated. *Rate* is so many hundredths of the base. *Percentage* is the part of the base taken, or considered. Any two terms being given, the third may be found. B. by R. gives P. P. divided by B. gives R. P. divided by R. gives B. Percentage is used in mercantile and stock transactions, interest, discount, exchange, insurance, taxes and equation of payments.

MERCANTILE TRANSACTION relates to purchase and sale of goods. *Price* is the value in money; called wholesale when in large quantities and retail in small quantities. *Agent* is one intrusted with the business of another, and is called consignee, when receiving goods; the one sending being the consignor. *Commission* is a per cent paid the agent. *Proceeds* is what is left after the commission and charges are paid. *Discount* is a deduction from list price. *Net Price* is the price after all deductions are made. *Cost* is the price paid for goods. *Profit* is the gain above cost. *Loss* is the difference below cost. *Stock* is capital in the form of shares; usually \$100. *Bond* is a note given by the government or a corporation and bears interest. *Par* value is face value. *Broker* is a stock agent. *Dividend* is an income from stock. *Assessment* is a payment by the shareholder on his stock.

INTEREST is money paid for the use of money. *Principal* is the money borrowed. *Promissory Note* is a written promise to pay a certain sum, at a specified time. *Face* is the principal. *Legal Rate* is that fixed by law. Quantities considered are: Principal, Rate, Time and Interest. Operations are to find Interest, the Principal, Rate and Time given, which equals P. by R. and T. P, R, I. given to find T.—equals I divided by I of P for 1 yr. at given rate. P, T and I to find rate—equals P. divided by I for time at 1 per cent. T, R and I to find P—equals I divided by T by R. T, R and Amount given to find R.—equals Amount divided by 1 plus R by T. *Compound Interest* is interest on interest after it becomes due.

PARTIAL PAYMENTS are part payments on a note and are usually en-

dorsed on the back of the note. Payments should draw interest from the time they are made until final settlement.

DISCOUNT is interest paid in advance. *Bank Discount* is the interest on the face of the note paid in advance, including three days of grace. *True Discount* is the difference between the present worth and the amount of the note. *Present Worth* is a sum, which will in the given time at the rate, amount to the same as the note.

INSURANCE is a promise by a company to make good a specified loss, for a given amount, in a stated time. The contract is called a *Policy*. *Premium* is the amount paid for the insurance. The kinds are Fire, Marine and Life. In Life insurance there are two kinds of policies. Life policies payable only at death. Endowment policies payable at death or a specified time.

TAXES include money paid by citizens to the government, for public purposes. *Direct* tax is levied on the property of the citizen. *Poll* tax is a tax on each voter. Taxes are divided into municipal, township, county and state taxes. Only a small per cent goes outside the county. Real estates is property, as lands. Personal property is movable property. Valuation is the estimated worth. The rate is so many mills on the dollar. The United States is supported by revenues from sale of public lands, postage, and revenue stamps on tobacco, whisky, oleomargarine and from customs. *Customs* are specific, when levied on the quantity of goods, and ad valorem, when levied on the cost of the goods imported from foreign countries.

RATIO is the relation of numbers expressed by their quotients. The numbers are called terms. Antecedent, or first term; Consequent or second term. Ratio is simple when consisting of two terms, and compound when it consists of two or more ratios. Principle—The value of a compound ratio equals the product of the antecedent terms divided by the product of the consequent terms. The terms of ratio are similar to those of a fraction; and multiplying or dividing has the same effect as multiplying similar terms in fractions.

PROPORTION is an equality of ratios, in which four numbers are proportional, when the first has the same ratio to the second, as the third has to the fourth; as 3:6::5:10. Principles—1. Product of the means equal the product of the extremes. 2. Product of the means or extremes divided by one of the means or extremes will give the other mean or extreme. Proportion is called simple when it comprises two ratios, and compound, when there are more than two ratios. Compound proportion is sometimes called Cause and Effect. Cause includes men and time, the effect, the work done; as 1st cause : 2d cause :: 1st effect : 2d effect. Arrange like terms on opposit sides of a line and cancel.

PARTNERSHIP is an association of persons for the transaction of business. *Capital* or stock is the money represented by the firm. *Assets*

include the property and amounts due the firm. *Liabilities* include debts owed by the firm. *Net Capital* is the difference between the assets and liabilities. Operations include those of percentage.

BANKRUPTCY is a condition in which the liabilities are greater than the assets.

AVERAGE includes methods of apportioning losses, equalizing partnership with time, equation of payments and mixing goods of different prices. The mean is in proportion to time, quantity and cost.

INVOLUTION is the process of finding the powers of a number. *Power* is the product arising from taking a number one or more times as a factor. The first power is the number itself, represented by a line or one dimension. The second power is called the square, represented by a square figure of two equal dimensions. The third power is called the cube, as it represents a solid of three equal dimensions. Higher powers may be represented by squares and cubes. The fourth power is a square of the second and the sixth power a cube of the second. Eighth power is a square of the fourth; Ninth is a cube of the third power. *Exponent* is the figure indicating the power. The product of any two powers is equal to the sum of their exponents. 2d by 2d gives 4th; 2d by 3d gives 5th; 3d by 6th gives 9th. All powers divisible by 2 are squares, and those divisible by 3 are cubes.

EVOLUTION is the process of evolving the first power or root from a given power. *Root* of a number is one of the equal factors. One of two equal factors is called the square root; one of three, cube root; one of four, fourth root, etc. Fourth root equals the square root of the square root; as 2 is the fourth root of 16. The square root of a number contains one-half as many figures as there are figures in the number, and the cube root one-third as many. The first root found is doubled, because additions must be made to two sides to preserve the square. It is used as a trial divisor to find the width of the additions. The width is annexed to the doubled root to find the contents of the corner square. Square root is used to find one of the sides of a square, when the area is given and one of the sides of a right angle triangle, when two sides are given. In finding the cube root, the root is squared to find the area of one face, and multiplied by three, because additions must be made to three sides to preserve the cube. This becomes the trial divisor, to find the thickness of the additions; to which is added three oblong and one square additions, which multiplied by the figure of the root, indicating the thickness, gives the solid contents of all the additions. Cube Root is used in finding one of the dimensions of a solid, when the solid contents are known.

MENSURATION includes the operations of finding the superficial and solid contents of surfaces and solids. Terms—Line has length; Angle is formed by the meeting of two lines; Angles are Right, Acute, Obtuse; Surface has two dimensions; as to form, plane or curved; as to shape, they

are rectangular, triangular, quadrilateral, polygonal and circular. A *Rectangle* is a figure having right angles; its area equaling the product of its two dimensions. A *Square* is a rectangle with all sides equal. A *Diagonal* is a line joining two opposite angles, and is equal to the square root of the sum of the squares of the adjacent sides. A *Circle* is a figure bounded by a curved line, equally distant from the center. The circumference is the curved boundary and is equal to the diameter multiplied by 3.1416. The diameter is a straight line passing through the center and terminating both ways at the circumference, and equals the circumference divided by 3.1416. The radius is one-half the diameter. The area of a circle equals the square of the diameter multiplied by .7854. A *Parallelogram* is a figure having opposite sides parallel and the area equaling the product of the dimensions. *Trapezoid* is a figure having four sides, two of which are parallel. Area equals the product of the mean dimensions. *Triangle* is a figure having three sides. Right angle triangle has one right angle and its surface equals one-half the product of the base by the altitude. Acute angle triangle has three acute angles; the surface is found the same as in a right angle triangle.

MENSURATION OF SOLIDS. A solid includes three dimensions. A *Prism* is a solid with parallel bases and parallelogram faces. Altitude is the distance from one base to the other. Convex surface is the sum of the area of the faces. A *Cube* is a solid with six square faces, eight corners and twelve edges; its contents equals the product of its three dimensions. A *Pyramid* is a solid having a rectangular base and triangular faces. Contents equals one-third of the product of the height by the area of the base. A *Cylinder* is a solid with circular bases and having a curved surface. Solid contents equals the area of the base multiplied by the altitude. Area of surface equals circumference by length, plus area of bases. A *Cone* is a solid with a circular base, and curved surface, terminating in an apex. Contents equal one-third of product of the area of the base by the altitude; surface equals one-half of the product of the circumference by the slant height. A *Sphere* is a solid having a round face, all points of which are equally distant from the center. Surface equals the square of the diameter multiplied by 3.1416. Contents equals cube of the diameter multiplied by .5236.

APPLICATIONS OF MENSURATION. Plastering is estimated by the square yard. Lath 50 in a bunch, covers 3 sq. yd. Lime, per barrel contains $2\frac{1}{2}$ bu. and with 10 bu. sand will lay 1000 brick; with 5 pounds of hair will cover 30 sq. yd of plaster two coats. Roofing is estimated by the square of 100 sq. ft. A workman will nail 100 sq. yd. of lath, or two square of shingles per day. Masonry in brick work is estimated by the 1000; 22 brick to the cubic foot. Stone work is estimated by the perch of 24.75 cu. ft. Painting is estimated by the square of 100 sq. ft. 1 gallon covers 250 sq. ft. two coats. Paper hanging is estimated by the double roll,

covering 70 sq. ft. Carpeting is estimated by the sq. yd. Mixed hay in the mow is estimated 500 cu. ft. per ton. Capacity of bins are estimated by cu. in. 2150.4 cu. in. equaling a bushel; or $1\frac{1}{4}$ cu. ft. In heaped measure add $\frac{1}{4}$ or count $1\frac{1}{2}$ cu. ft.; corn in the ear $2\frac{1}{2}$ cu. ft. In estimating cisterns count 4.2 cu. ft. per barrel of 31 gal.

METHODS.—Teach beginners the combination to 10 in the four fundamental rules by the use of counters or blocks; known as the Grube method. Aim at readiness and accuracy. Learning tables is a work of memory, but may be aided by diagrams showing relative values. Introduce mental arithmetic in the higher grades, where the reasoning faculties are more mature. Make drawings and diagrams for teaching weights, measures and fractions and explain to pupils the relative values of the denominations. Give easy problems in your drills and encourage pupils to form problems for others to solve. Always drill your class on a lesson when you assign it. Have contests in reciting tables and in forming and solving problems. Keep up a continual review of some part of the fundamental rules. Solution of problems in the book should not be the main end, but mastery of the subject for practical business, for mental discipline, inattention and power to reason. Don't make a hobby of arithmetic, for it don't contain all the knowledge of value, and school life is too short to give it more time than is due to it.

GEOGRAPHY.

GEOGRAPHY is that branch of science, which treats of the earth. 1. Its relation to the solar system. 2. Its relation to nature. 3. Its relation to government and society.

MATHEMATICAL GEOGRAPHY treats of the relation to the solar system, which includes the sun and all the planets revolving around it. The orbits are the paths of the planets. Satellites are the moons of the planets. Fixed stars are distant suns, so remote that over three thousand years time is required for light to reach us from some, which are visible to the eye. Universe includes all the solar systems. All the planets are in the form of spheres, slightly flattened at their poles, and in position, are inclined to their orbits. They rotate on their axis, which causes day and night, and revolve around the sun, which causes the year, and being inclined to their orbits, cause a difference in seasons. The proofs of the earth's rotundity: 1. Vessels have sailed around it. 2. Its shadow on the moon. 3. Its surface curves away from a straight line eight inches to the mile. 4. A vessel approaching shows the top sail first. 5. Other planets are round. Horizon is the limit of vision. Direction is taken from the

point where the sun rises and is called East; other points are named West, North and South. Location of places include distance and direction from each other, determined by lines and circles, called parallels and meridians. Parallels are the small circles passing around the earth, from east to west, parallel with the equator and grow shorter as they approach the poles. *Equator* is the largest parallel and divides the earth into equal parts. *Tropics* are parallels $23\frac{1}{2}$ degrees from the equator, each way, and so located by the inclination of the earth's axis. *Polar Circles* are $23\frac{1}{2}$ degrees from the poles and located by the same cause as the tropics. *Pole* is the termination of the earth's axis at the surface. *Meridian* is the half of a great circle which passes from pole to pole. *Latitude* is the distance in degrees north or south from the equator. *Longitude* is the distance in degrees east or west from a prime or first meridian. *Zones* are belts into which the earth is divided by the tropic and polar circles. Torrid zone is located between the tropics; the Temperate zone between the tropics and polar circles; the Frigid zones are bounded by the polar circles. *Globes* are spheres on which circles and maps are drawn to represent the relative location of the great and small circles, the motions of the earth, and the great land and water divisions.

PHYSICAL GEOGRAPHY treats of land, water, air, plants and animals. The earth's surface contains 197 million square miles; 53 million of which is land and 144 million is water. As to form the land is divided into *Continents*, the largest division of land; *Islands*, small divisions surrounded by water; *Peninsulas*, bodies of land nearly surrounded by water; *Capes*, points of land extending into the water; *Isthmuses*, narrow necks of land connecting two bodies of land. As to elevation the surface consists of *Mountains* or high elevations of land, grouped into a range, several of which form a chain; several chains near and parallel with each other, forming a mountain system. *Height* of a mountain is its vertical distance above sea level. *Table land* is a high level tract of land. *Plain* is a level tract of land. *Valley* is the low land between highlands. *Desert* is a tract of land unproductive. *Oasis* is a fertile spot in a desert. *Volcano* is an opening in the earth's crust through which lava is forced. The cup-like opening is called a crater. Eruptions are caused by steam forming in the interior. *Earthquakes* are trembling vibrations caused by volcanic action.

WATER of the earth is divided into oceans, the largest divisions; *Seas* are divisions nearly surrounded by land. *Gulf* or bay extends into the land. *Strait* connects two larger bodies of water. *Sound* is a shallow channel or bay. Motions are *waves*, or alternate rising and falling of the surface of water. *Tides* are long waves caused by the attraction of the sun and moon. Flood tide is the rising of the water for six hours. Ebb tide is the falling of the water the next six hours. *Ocean Currents* are movements of the surface waters of the ocean, caused by the heat of the sun

and the rotation of the earth. Their velocity is 10 miles per day. *Gulf Stream* is the principal current of the Atlantic ocean. Kuro Siwo or Japan current is the chief current of the Pacific.

WATER of the atmosphere—*Vapor* is water in the air caused by the heat of the sun. The amount of vapor the air will hold depends on the temperature; as warm air holds more than cold air. Air cooling causes dew, fog, clouds, rain, snow and hail. *Dew* comes from air chilled below the point of saturation. *Fog* is condensed vapor floating in the air near the earth's surface. *Clouds* are condensed vapor floating high in the air, usually between layers of air differing in temperature. *Cirrus* clouds are high, cold and feathery in appearance. *Cumulus* clouds are heaped by an upward current of air. *Stratus* clouds are in layers from settling vapor. *Nimbus* clouds are shapeless and consisting mostly of rain drops. *Rain* is cooled vapor, falling in drops. It is most abundant in the torrid zone and along the coast. *Snow* is frozen vapor formed into flower-like crystals. *Hail* is frozen rain.

WATERS of the Continent are *Springs*, which issue from the earth; *Brooks*, small streams from springs; *Creeks*, streams formed by brooks, which unite and form larger streams called a *River*. Source of a stream is where it rises; channel, the bed through which it flows; mouth, where it empties. *River System* is a large river with all its tributaries. *Basin* is the land drained by a system. *Water-shed* is the ridge or edge of the basin. *Delta* is the formation at the mouth of a river by the sediment washed down. *Estuary* is the wide mouth which faces the tide. *Lake* is a body of water surrounded by land; the head is where the water comes in; the foot is where the water passes out. *Lakes* having no outlets are salt lakes. *Glacier* is an immense mass of ice and snow moving down a mountain slope. *Icebergs* are large masses of floating ice broken from polar glaciers.

AIR is an invisible gas which surrounds the earth, and it extends from 50 to 200 miles above the surface. Its weight or pressure is 15 pounds to the square inch, measured by a barometer. *Wind* is air in motion, caused by the heat of the sun and unequal temperature; the warm air rising and the cold air rushing in to take its place, similar to the motion of boiling water. *Trade winds* move westward and toward the equator in the tropical regions. *Monsoons* are winds alternating on the west coast in the temperate zone, semi-annually. *Variable* winds occur in the interior of continents. Land and sea breezes occur along the coast, blowing to the land in the day time and to the sea during the night; caused by the unequal heating of the surface of land and water. *Storms* are caused by the rapid rising of heated air, causing the air to rush in from all directions. *Cyclones* are whirling storms. Thunder storms are clouds charged with electricity. Lightning is the passing of electricity from cloud to cloud, or from the clouds to the earth.

CLIMATE is the condition as to heat and moisture, modified by latitude, height above sea level and proximity to seas. *Isothermal* lines connect points having the same average temperature.

MINERALS are of three kinds: Force producing; as coal of vegetable origin. Industrial metals; as iron, copper, zinc, tin, gold and silver, with their various alloys. Building stone includes granite, marble, lime and sandstone.

VEGETABLES include plants distributed according to climate and is greatest in the tropical regions and diminishing towards the poles and tops of mountains. Grasses are the most widely distributed; as they are found in all latitudes, but thrive best in temperate regions. Grains are species of grass indigenous to Asia except corn which is native of America.

ANIMALS like plants, increase from the poles toward the equator. In polar regions they are distinguished on the land for their fur, and in the water for their covering of fat. In the temperate zone they are domesticated and most useful. In the tropical region they are large and powerful, besides there are many reptiles and monkeys.

POLITICAL GEOGRAPHY treats of tribes and nations banded together for mutual protection. *Tribes* are bands of uncivilized people, governed by chiefs, whose will is law. *Nation* is an organization of civilized people, having a system of written laws. *Mankind* comprises about 1,500,000,000 of people. Classified socially, they are Savage without written laws; Barbarous, without homes, being wanderers; Half Civilized, having some skill in agriculture and manufacturing and limited education; Civilized possess knowledge of the arts, science, education, literature and are self governing. *As to Races*, man is divided into the Caucasian, Mongolian, Negro, Malay and Indian. *As to Religion*, they are Christians who believe in the Bible; Jews, who reject the New Testament; Mohammedans, who believe Mahomet was the Great Prophet; Brahminism, including Brahma the creator, Vishnu the preserver and Siva the destroyer; Buddhism teaches transmigration of souls; that as soon as we die we are born again to a higher or lower state or animal, depending upon our obedience in life to the laws of Buddha.

GOVERNMENTS. A *Republic* is a nation in which the people make their own laws and elect officers to enforce them. *Monarchy* is a government in which the supreme power is in the hands of one person for life. It is absolute when wholly invested in the ruler and limited when the laws are made by the people. *Empire* is a monarchy comprising several nations. *Kingdom* is a monarchy ruled by a king or queen. *Capital* is the city where the laws are made.

INDUSTRIES are the occupations of mankind. *Agriculture* is cultivating the soil, producing food and clothing; giving employment to one-half the population of the United States. *Manufacturing* is making from raw material things useful to man; as lumber, cloth, tools, machinery, leath-

er, furniture and books. *Mining* is taking minerals from the earth; as coal, iron, gold and silver. *Lumbering* is cutting trees into logs and sawing logs into plank. *Commerce* is the exchange of goods and products by means of transportation on railroads, rivers, canals and vessels.

DESCRIPTIVE GEOGRAPHY treats of the description of a *Continent*; as to situation in the hemisphere, boundaries, latitude, longitude, extent, relief forms, drainage, contour forms, ocean branches, zones, races, countries and history. Of *Countries*: Situation, boundaries, extent, map, relief contour, climate, resources, people, government, religion, and possessions. Of *Oceans*: Situation, shape, size, currents, islands, cables and routes of travel. *State*: Situation, extent, relief, drainage, resources, cities, institutions and history. *County*: Situation, ranges, civil and congressional townships, shape, extent, map, relief drainage, resources, population, cities and towns, railroads, schools, newspapers, public buildings, officers, courts and history. *Township*: Name, shape, size, school districts, map, natural forms, towns, boundaries and history.

LOCAL GEOGRAPHY in addition to the above points on the township, county and state, will include the geography of the school room; as to the relative location of different objects and making a map to represent them. The cardinal and semi-cardinal points as to their location in nature and on the map. Measurements including the different lengths. Map the school grounds and neighborhood, including lessons on soil, plants, trees, etc. Maps should be made of each farm; direction and distance each farm is from the school house: when the school house was built: teachers who have taught there; oldest settlers, etc.

GOVERNMENT SURVEY SYSTEM is a system of survey by which a large territory is laid off into townships six miles square, by means of a Principal Meridian and a Base Line. The Base Line extends east and west near the middle of the territory to be surveyed. Principal Meridian extends north and south, crossing the base line near the center of the territory. *Townships* are counted from the base line north and south; each six miles being run off as a township. They are known by numbers from the base line. *Ranges* are measured from the Principal Meridian east and west; each six miles constituting a range indicated by the Roman numerals from the Principal Meridian. A *Congressional* township is six miles square, and divided into 36 sections or square miles. Sections 16 and 36 are school sections; the proceeds from the sale of the land of school sections go into the permanent school fund. On account of the converging of meridian lines, correction lines are made every twenty-four miles in this latitude and more frequently as the latitude increases northward. *Sections* are divided into halves, quarters, and halves of quarters and quarters of quarters. The subdivisions of a section are named by their location; as the North half ($N. \frac{1}{2}$) 320 acres; Southeast quarter (S. E. $\frac{1}{4}$) 160 acres; East half of the Southeast quarter ($E. \frac{1}{2}$ of S. E. $\frac{1}{4}$) 80 acres; South-

east quarter of the Northwest quarter (S. E. $\frac{1}{4}$ of N. W. $\frac{1}{4}$) 40 acres.

METHODS.—Pupils should first have lessons in observation of form, place, plants, animals and minerals. In connection with observation lessons, special attention should be given to the language of geography, including such terms as may be illustrated in the immediate locality. The map picture should be introduced at the very beginning. Pupils should be taught to read maps, and to make maps of places familiar to them. The sand box or moulding board should be used in developing relief forms, which may afterward be worked in paper pulp on a smaller scale.

The globe should be used in teaching the form, size, circumference, diameter, equator, tropic and polar circles, zones, meridians, motions, relative location of continents, oceans, etc. The phenomena of day and night, change of seasons, trade winds, absolute and relative time, changes of the moon, eclipses and tides. Incline the axis in different positions and observe the effect it would have.

The topical method which is best for advance classes, consists of outlining the lesson and assigning each pupil a special topic, on which to prepare and recite without questions. Questions usually suggest the answer. Map drawing is for the purpose of impressing the facts of location on the memory and not for the purpose of teaching drawing. Card board may be cut of the form of a continent or country and used for obtaining a correct outline of a country, which may afterwards be filled in. Drawing maps in squares representing a hundred or a thousand square miles, gives a clear idea of the size. Progressive maps with the outline dimly printed, to be developed and filled in is a practical method in map study.

Outline maps should be used continually for pointing out and describing the location of places; pupils asking questions for each other to point out.

Reviews and games should be used frequently to keep up an interest. Divide the school into a geographical spelling match; stating geographical facts; read items from newspapers and have pupils locate the place; take imaginary journeys, describing the places visited; descriptions of places given by teacher or pupils, the name to be guessed.

The variety of methods is unlimited in the ingenious teacher; but the above will be suggestive and will start you in the right line.

LANGUAGE.

LANGUAGE study for primary grades, treats of proper forms of expression and use of words, without reference to rules or technical terms.

PRINCIPLES—1. A child learns by example and practice and not by

rules and theory. 2. Habits of utterance and forms of expression, learned in childhood, cling to us throughout life.

ORAL lessons should be given first in making stories about familiar objects and pictures, followed by written stories.

NAME ideas may be developed by having pupils write their own name, names of schoolmates, school, things to eat and wear, and names of places.

IS and ARE used in statements and questions; as, The boy is here. The boys are here. Is the boy here? Are the boys here? Make statements and change the statement to a question, and the use of is to are. Repeat this until the habit has been formed for the correct use.

WAS and WERE—The paper was torn. The papers were torn.

HAS and HAVE—A bird has claws. Birds have claws.

SEE, saw, have seen, has seen. I see, I saw, I have seen, I had seen, He has seen.

WENT, has gone, have gone, had gone. I went. He has gone. They have gone. He has gone.

DID, has done, have done, had done. I did. He has done. You have done. They had done.

SIT and SET—I sit on a seat. The bucket sets on a table. We sat here.

LIE and LAY—I lie on the sofa. You lay the book down. I lay on the sofa yesterday. I have lain on the sofa.

HOMONYMS—two, to, too; here, hear; no, know; their, there; write, right; to be used in filling blanks and forming statements and questions.

OBJECTS—Name, parts, color, shape, size, of what made and use; as ball, book, slate, chair, house, fruit, leaves, and other objects familiar to the pupil.

QUALITIES—As thin, smooth, sour, hard, heavy, round, juicy, cold, etc., used as above.

ACTIONS of pupils noticed in the room and in pictures, formed into statements and questions.

A and AN—As a hat; an ax.

THIS and THAT—These and those; as this boy; these boys. That girl; those girls.

POSSESSION; as, This is John's book.

THEIR and THERE; as, Their hats are there.

INITIALS—Henry Wadsworth Longfellow, written, H. W. Longfellow.

ABBREVIATIONS —Mr. for Mister; Mrs. for Mistress.

CAPITAL letters at the beginning of a statement or question.

MARKS at the end of a statement, (.) or question, (?). Comma between words when three or more have been used in the same way; as, I can see, hear, smell and taste.

DICTATION exercises consist in reading statements or stories for pupils

to write and compare and correct errors in spelling, use of words, capital letters and marks.

MEMORY lessons consist in copying and committing to memory easy lines containing gems of thought and truths worth remembering; as,

“When doubtful which is right, which wrong,
This you can safely do:
Do unto others as you would
That they should do unto you.”

COMPOSITION study consists in writing short stories from outlines, about objects, animals, persons or scenes, as they appear in real life, or in a picture.

LETTER writing consists of the Head, which includes the place and date; as, Brooklyn, Iowa, May 20th, 1892. The Salutation; as, My kind friend—. Body of the letter which consists of statements made. Conclusion, consisting of the closing statement; as, Yours respectfully, John Smith.

REPRODUCTION exercises consist in reading stories for pupils to write or reproduce from memory.

QUOTATION exercises are similar to memory exercises.

INFORMATION exercises are based on elementary science study, and lessons in observation of animals, as to their kind, form and habits.

NARRATIVE is describing what has been seen on a visit to some place; including statements about things noticed, that would be of interest.

PARAPHRASING is similar to reproduction, and consists in changing poetry to prose, using your own language.

BIOGRAPHICAL sketch is writing a description of the life of a person; including place and time of birth, childhood, education, life occupation, best known work, time and place of death.

AUTOBIOGRAPHY is the biography written of one's self.

TELEGRAMS are statements made in the fewest words possible and sent over a wire to some distant station. Ten words cost 25 cents.

METHOD.—Teach simple sentences beginning with a capital and ending with a period. Pupils should reproduce stories told them and write stories of their own. Learn to use the language by using it. Have pupils copy paragraphs and exchange papers and correct spelling and use of capitals.

DESCRIPTIVE COMPOSITION.—Write a short account of the following objects, describing their construction, materials, form and use: Gun, plow, cart, knife, bridge, railroad, etc.

Write a description of the process of making the following: Flour, butter, salt soap, glass, paper and gas.

Write what they are, where raised, where obtained, general appearance, parts and use: Apple, cherry, banana, melon, orange, lemon, grape and cocoanut.

Methods for themes in higher grades: Introduce subjects by a few suitable remarks. Explain the meaning of the subject distinctly as to what it includes. Explain the origin and principles. Give an account of the development and progress. Show the influence upon society and its relation to other subjects. Conclude with reflections on the subject not mentioned. This may be varied to suit other subjects.

Themes: Printing, agriculture, newspapers, commerce, architecture, music, childhood, climate, time, nature, economy, history, biography, memory, conversation, custom, character, trifles, opinion, temper, fame, intemperance, truth, education, genius, curiosity, language, society, literature, fashion, professions, art, monopoly, tariff, labor, government, suffrage and amusements.

GRAMMAR.

OBJECTS are things, which we can perceive through the senses. *Idea* is the name of an object. *Thought* is a proper grouping of ideas. *Word* is the sign of an idea.

LANGUAGE is the expression of thought by means of words.

GRAMMAR treats of the principles and usages of language. The principal divisions of grammar are. Etymology, Syntax and Prosody.

ETYMOLOGY treats of the classification, properties and derivation of words.

SYNTAX treats of the arrangement of words in sentences according to the best usage.

PROSODY treats of the quantity of syllables, of accent, and laws of versification.

PARTS OF SPEECH include the classes into which words are divided, according to their meaning and use; as, noun, pronoun, adjective, verb, adverb, conjunction, preposition, and interjection.

PROPERTY of a part of speech is its change in form to express different shades of meaning; as, gender, person, number and case to nouns; voice, mode, tense, person and number to verbs; comparison to adjectives and adverbs.

DECLENSION is arranging the noun or pronoun in regular order, to express number and case.

INFLECTION is the variation or change in the form of a word, by the different properties.

CONJUGATION is the inflection, in regular order, of the mode, tense, voice, person and number of a verb.

COMPARISON is the inflection of the adjective to express different degrees of quality.

PARSING is naming the parts of speech, telling the properties, pointing out the relation to other words and giving the rule for the construction of a word.

NOUN is a name. *Common* noun is the name of a class or kind. *Proper* noun is the name of some particular person, place or thing. *Abstract* noun is the name of a quality, apart from the object. *Participial* noun is the name of an action; as, singing. *Gender* is a distinction, with regard to sex. *Masculine* denotes male. *Feminine* denotes female. *Common* denotes either male or female; as parent. *Neuter* denotes neither; as, stove. *Person* distinguishes: 1st, the speaker; 2nd, the person spoken to; 3rd, the person spoken of. *Number* is that form which distinguishes one from more than one. *Singular* means one; as, boy. *Plural* means more than one; as boys. Nouns form their plural by adding s, es, ies, ves, and by different words; as caps, boxes, cities, loaves and men. *Case* is the relation of a noun to other words. *Nominative* case is the subject or predicate of a sentence; as, The *boy* is studying. The girl is a *scholar*. *Possessive* denotes ownership, authorship, origin or kind; as Mary's slate; Hunt's speller; the sun's rays; men's clothing. This case is generally indicated by the apostrophe and s following the noun. *Objective* case usually follows the transitive verb or the preposition; as, Boys dislike *grammar*. John went to *town*. *Absolute* or independent case is independent of a governing word; as, John, come here; Honor being lost, all is lost. *Apposition* is a noun in the same case, used by way of explanation; as, Grant the general, became Grant the President. Rules for construction belong to case and are simply the reasons for the case or relation.

PRONOUN is a word used instead of a noun; as *his* book, *my* knife. *Antecedent* of a pronoun is the noun or expression for which it stands. The *Properties* are the same as the noun for which it stands. *Personal* pronouns show by their form whether they are first, second or third person; as I, he, she, they, etc. They are compound by adding self or selves to the simple personal pronoun. *Possessive* pronouns represent both the possessor and thing possessed. They are mine, thine, his, hers, ours and yours. They are never in the possessive case. *Relative* pronoun is used to represent a preceding word or phrase, to which it joins a limiting clause. They are who, whom, which, that and what. They are compounded by annexing ever and soever. They agree with their antecedents in properties. *Interrogatives* are who, which and what, when used in asking a question. The subsequent of an interrogative pronoun is that part of the answer which it represents.

ADJECTIVES are words used to describe and define a noun. They are divided into two classes, descriptive and definitive. *Descriptives* limit or define a noun by denoting a quality belonging to it; as sweet, square, good, etc. They are compound when composed of two words;

as high-sounding; Participial, when derived from a verb; as, a running horse. Descriptive adjectives are compared to denote different degrees of quality. *Definitive* adjectives define or limit the meaning of a noun without denoting any quality. They are divided into three classes: Articles, Pronominals, and Numerals. *Articles* include *a*, *an* and *the*. The *a* is called the definite; *a* and *an* the indefinites. *Pronominals* are definitives, which may without an article prefixed, represent or stand for a noun. They are divided into Demonstratives, Distributives and Indefinites. *Demonstratives* point out definitely; as, this, that, these, those, etc. *Distributives* represent objects separately; as each, every, either, neither. *Indefinites* represent objects in a general way; as all, any, other, certain, many, little, no, none, and etc. *Numeral* adjectives express number or order; as four, fourth. *Cardinals* denote simply the number; *Ordinal*, the position or rank; *Multiplicative*, the fold; as four-fold.

VERBS are words expressing action, being or state; as, I write; You are; He stands. With respect to use, they are Copulatives, Transitive and Intransitive. *Copulatives* join predicates to subjects. It is always some form of the verb to be. *Transitive* verbs require an object to complete their meaning. *Intransitive* verbs do not require an object to complete their meaning. As to form, verbs are Regular or Irregular. *Regular* verbs form their past tense by adding *d* or *ed* to the present form; as form, formed. *Irregular* verbs form their past tense and participial forms irregularly; as go, went, gone; do, did done; see, saw, seen. *Voice* is that form of the transitive verb showing whether the subject acts or is acted upon. *Active* voice represents the subject as acting. *Passive* voice represents the subject as receiving the action, and is indicated by prefixing some form of the verb to be, to the perfect participle, of the transitive verb. *Participle* is a word derived from a verb partaking of the properties of the verb, adjective or noun. Present participle denotes the continuance of an act; as kicking, being kicked. Perfect denotes completion; as seen. Compound denotes completion in the time represented by principal verb; as, Having recited his lesson, he left school. *Auxiliary* verbs are those used in the inflection of other verbs. They are do, be, have, shall, will, may, can and must. *Mode* is the manner in which the action, being or state is expressed. There are five: Indicative, Subjunctive, Potential and Infinitive. *Indicative* asserts a thing as a fact; *Subjunctive* as doubtful; *Potential* indicates power, necessity, liberty, duty or liability; *Imperative* expresses a command, entreaty and permission; *Infinitive* expresses action, being or state without affirming it; sometimes called the infinitive phrase. The infinitive may be used as a subject of a verb; as, To run was impossible. As the object of a verb; as, He wishes to read. In apposition; as, What fun! to coast upon the hill. Independent; as, To tell the truth, [I was sick. *Tense* denotes the time of an action. There are three: Present, Past and

Future. *Present* denotes present time. *Present perfect* represents an action past but connected with the present; indicated by the sign, have. *Past* tense represents an act in time wholly past; as, I wrote. *Past perfect* represents an act completed before some other past time; indicated by had. *Future* tense, an action in the future. The signs are shall and will. *Future perfect* represents an act as finished before another future time; indicated by the sign shall, have or will have. *Unipersonal* verbs assert independently of any particular subject; as, It snows; Methinks. *Principal parts* of a verb are the present, past and perfect participle forms. *Synopsis* of a verb is its variation through modes and tenses in a single person and number. *Defective* verbs are those wanting in some of their parts; as beware, ought, quoth and the auxiliaries.

ADVERBS modify the meaning of verbs, adjectives, participles and adverbs; as, sings sweetly; very rough; quickly broken; tolerably well. Adverbs of *Time* answer When? How long? How often? Of *Place*, Where? *Cause*, Why? *Manner*, How? *Degree*, How much? *Conjunctive* adverbs join clauses and modify the verb in the principal clause. Some adverbs admit of comparison.

PREPOSITION is a word showing the relation between its object and some other word; as, The teacher *of* grammar, came *in* the room.

CONJUNCTIONS are words used to connect words, sentences and parts of sentences. The two classes are Co-ordinate and Subordinate. *Co-ordinate* join elements of equal rank; *Subordinate* join elements of different rank.

INTERJECTIONS are words denoting emotion. Hurrah! O my! Pshaw! "Ouch!"

SYNTAX treats of the synthesis and analysis of sentences. *Synthesis* is the proper arranging of words to form a sentence. *Analysis* is the separating of a sentence into its elements, and expressing the class and relation of the elements. *Diagraming* is a convenient arrangement of the parts of a sentence for examination, by means of lines, symbols, numerals or braces.

SENTENCE is an arrangement of words making complete sense. As to nature, they are divided into *Declarative*, which declares or asserts a fact; *Interrogative*, which asks a question; *Imperative*, which make a command; *Exclamatory*, which express strong feeling. As to form, they are *Simple*, having a single subject and predicate; *Complex*, consisting of a principal clause modified by a subordinate proposition. *Compound*, composed of two or more propositions of equal rank. As to position, they are principal and subordinate propositions in complex sentences.

ELEMENTS are the constituent parts of a sentence. *Subject* is that part of a sentence of which something has been asserted. *Predicate* is that part of a sentence which makes the assertion. *Simple* elements are the unmodified elements. *Complex* elements include the modifiers. *Com-*

pound elements include two or more elements of equal rank. *Complements* are those parts or elements of the predicate, which complete the sense. They are known as the Attribute and Object complements. *Modifying* elements are classed as adjective, objective and adverbial. As to form, they are simple, complex or compound. As to rank, they are of the first class, when a single word; of the second class, when composed of a preposition and object; of the third class, when a sentence. Arrangement of elements is placing them in their usual order. They may be in regular order or in an inverted or transposed order.

PHRASES are groups of words not making complete sense when standing alone. They are classed as adjective, adverbial, infinitive, prepositional and idiomatic. In their form they are simple, complex and compound. *Clauses* are the separate propositions of a complex or compound sentence. They are classed as principal, subordinate, subject, predicate, relative, appositive, interrogative, objective, adverbial, etc.

FALSE SYNTAX is a violation of the proper arrangement or use of words in a sentence.

RULES are directions in the proper use of words; also what common errors should be avoided. 1. Use an before vocal and a before subvocal and aspirate sounds. 2. Do not use them for those. 3. Do not use wrong case forms. 4. Express general truths in the present tense. 5. Avoid the wrong form or contraction of the verb.

PROSODY.—*Verse* consists of lines grouped by metrical rules. *Poetry* is discourse written in metrical language; it is in rhyme or blank verse. *Rhyme* consists in similarity of sound at the end of each or alternate lines. *Blank verse* is without rhyme. *Stanza* is a group of lines in poetry. *Poetic feet* is a grouping of syllables by accent. *Poetic* pauses are of two kinds, called final, at the end of a line, and cesural, near the middle of a line.

METHODS.—Language work should always precede the study of technical grammar, which should not be taken up before the fifth grade. The object of lesson work is to form the habit of correctness in the use of language both oral and written. Correct oral language, consists of correct pronunciation and use of words in their proper order. Correct written language consists of correct spelling and use of capitals, in addition to the points required in oral language. See that the thought is right, truthful, clear, and the expression direct, simple, free and natural. Follow the above in connection with each lesson.

Imitation of good forms of expression from the teacher and from reading. Correct bad forms of expression, used by pupils. Do much copy work—Study objects and express your thoughts, both oral and written. Act and have pupils express what was done. Use pictures and have pupils describe what is seen in them; as to the objects and what

they seem to be doing. Tell stories and have pupils reproduce them orally and in writing. Require full and complete sentences.

Composition work consists of the above and additional subjects; as a description of home, school, trees, a journey, how things are made, and autobiographies of different objects or animals.

In grammar study; a clear definition of each term should be the first point mastered. The models for parsing should be studied carefully. A sentence may be written vertically, and the parsing of each word written opposit; or columns may be formed, one for each part of speech. Much writing will facilitate time in both study and recitation. Attention to the different parts of speech should be given in the reading classes of the grammar grades.

Analysis may be studied by diagrams until a mastery of the subject is attained, when it should be dropped. Much time is frequently wasted in diagraming sentences, which are not analyzed afterward. Have the diagram work done at the seat, and the time of the recitation given to analysis.

Diagraming may be done in different ways: By placing numerals over the principal elements and initial letters over the modifying elements, with lines drawn under or over, connecting modifying with principal elements. A line may be drawn and divided into two parts, on which may be written the principal elements; the modifying elements written on lines below, opposit, and connecting with the element above which they modify. The brace system places the subject above the predicate verb, with modifying elements set off by braces when more than one, and by bars when single.

PHYSIOLOGY.

We have a limited amount of vital force upon which we may draw. We may become spendthrifts and waste or injure this force, or be wise and develop and protect our powers for mature life. Physiology may be called the bookkeeping of the body, in which a strict account must be given of the receipts and expenditures of the vital forces. We should not only know how to use, protect and develop an organ, or part of the body, but we should have some knowledge of diseased conditions, the cause and simple remedies to be used in the first stages. We should know something of the origin, nature and the proper and improper use of stimulants and narcotics. How they effect the user, physically, morally and socially. We should not limit our knowledge to text-books alone, but open our eyes and observe subjects daily before us. Nature's laws are inviolable. Vital force borrowed is demanded with compound

interest about fifteen years after, which cause many to go into physical bankruptcy, and many to go down to premature graves.

PHYSIOLOGY in a general sense is the science of the structure, function and laws of preservation of the animal body. The three divisions are, *Anatomy*, which treats of the structure; *Physiology*, which treats of the function or use; and *Hygiene*, which treats of the laws of preservation and health.

BONES are composed of animal and mineral matter, which varies in proportion to age: animal matter greater in early life, and mineral in old age. The form of bones vary as to use; being long and round; broad and thin; short and thick. They are used for protection, motion, and to maintain the form of the body. *Skeleton* is the framework of the body and consists of 200 to 204 bones, divided into the

HEAD, of 28 bones: Cranium 8, consisting of the Frontal, 2 Parietal, 2 Temporal, the Sphenoid, Ethmoid and Occipital; Face 14 bones, consisting of 2 Superior Maxillary, Inferior Maxillary, 2 Malar, 2 Lachrymal, 2 Turbinated, 2 Nasal, Vomer and 2 Palate bones; Ear 6 bones—Hammer, Anvil and Stirrup.

THE TRUNK, 54 bones: Spinal Column 24, Ribs 12, Sternum, Os Hyoides and Pelvis 4—consisting of 2 Innominata, Sacrum and Coccyx.

THE LIMBS, 124 bones: Upper limbs 64—consisting of Shoulder—Scapula and Clavicle; Arm—Humerus, Ulna and Radius; Hand 8, Wrist or Carpel, 5 Metacarpel, 15 Phalanges. Lower limbs, 60 bones: Leg—Femur, Patella, Tibia and Fibula; Foot—7 Tarsel, 5 Metatarsel, 14 Phalanges. Bones are united by joints which are covered with a membrane secreting and lubricating the joints. Tobacco and alcohol stunt the growth of the bones.

DISEASES of the bones: Rickets is a lack of mineral matter and may be cured by taking food containing lime. Sprains are breakings of the ligaments binding the bones or joints together. Dislocation is forcing a bone out of its socket or joint. Fracture is breaking or cracking a bone. Felon is an inflammation of the periostium, a membrane covering the bones.

MUSCLES are the bands attached to the bones, which, by contracting or shortening, move and hold the bones in different positions. They are arranged in pairs and each muscle is composed of fibers, which is made up of small cells. Tendons are the white cords attaching the muscles to the bones. Walking is alternate falling and catching yourself. Voluntary muscles act under the control of the will, while involuntary do not. *Hygiene* consists in properly exercising the muscles by walking and movement exercises and avoiding severe strains. The muscles are susceptible to marvelous training; as shown in the voice, and in the musical performer.

DISEASES.—St. Vitus Dance is a disease of the voluntary muscles,

causing spasmodic action which may be cured by improving the general health and keeping quiet. Lock-jaw is a contracted condition of the muscles of the lower jaw, caused by some simple wound and may cause death. Gout affects the joints of the feet, indicated by a swollen condition usually caused by high living. May be cured by dieting and use of simple tonics. Rheumatism affects the white, fibrous tissue of the joints. Inflammatory or Acute is a disease of the blood and requires blood treatment. If it continues it becomes chronic and is liable to affect the heart. It is caused by exposure in damp weather. Lumbago is a disease of the lumbar muscles of the back, usually called a crick in the back. Alcohol changes muscles into fat and thus weakens them. Tobacco weakens the nerves and therefore affects the muscles.

THE SKIN is composed of the Cuticle or scarf skin, which covers the Cutis or true skin, which contains the nerves and blood vessels. Complexion is due to the coloring matter on the surface of the Cutis. Pores are openings through the skin allowing waste matter to escape. Hair grows from a bulb or root in the skin: it is very much like the Cuticle. The hair protects and equalizes the temperature of the skin and body. Nails protect the ends of the fingers and toes and is very much like the cuticle, a horny-like substance. *Membranes* cover the inside and outside of the body. The mucous membrane covers the inside cavities and the skin the outside, and acts as filters as well as protectors. Fat is an oil deposited in the cells of the skin, and in the hollow of the bones called marrow. *Teeth* are the hard, bony appendages attached to the jaws and used in masticating the food. The parts are crown, enamel and dentine. There are 32 in a full set consisting of cutting teeth or incisors, canine or eyeteeth, bicuspid and grinders or molars. Milk teeth is the first set. Teeth decay if not kept clean. *Glands* are sacks secreting oil in the skin to keep it soft. Perspiratory glands are very numerous and pass off waste matter in the form of vapor.

HYGIENE;—Bathe frequently to remove the dead skin and invigorate the system. Wear clothing suited to the condition of the body and weather.

DISEASES.—Corns are thickening of the cuticle, caused by tight shoes; may be cured by soaking and paring. Ingrowing nails caused by pressure; may be cured by removing cause and scraping nail in the middle. Warts are enlarged papillae and may be removed by nitric acid. Chilblain is an inflammation of the feet, usually caused by exposure to cold.

RESPIRATION AND THE VOICE.—Larynx is a box-like cavity at the upper end of the windpipe, covered by a leaflike valve called the epiglottis, which opens when we breathe and closes when we swallow. Vocal cords are located on the sides of the opening or glottis. Different tones are produced by the length and tension of the cords. Vocal

sounds are made by the vibration of the vocal cords. Windpipe or trachea extends from the larynx to the lungs: it divides into two branches called bronchi, which divide and terminate in the air cells. These tubes are lined with cilia or hairs which catch the dust. The lungs are enclosed in a thin membranous wrapper called the pleura. Inspiration is admitting the air by contracting the diaphragm and while Expiration is forcing the air out by relaxing the muscles. Coughing, sneezing, laughing and crying are spasmodic actions of the lungs. One gallon is the average breathing capacity, while a pint is the usual amount changed each breath. Air carries oxygen to the blood and carbonic acid away. Air must not be breathed over and over, which necessitates ventilation, furnishing 2000 feet of fresh air each hour to each person. We breathe at least 7 million times a year, by which we purify 3,500 tons of blood.

DISEASES.—*Pneumonia* is an inflammation of the air cells of the lungs, caused by cold. Treatment should be sweating and good nursing. *Consumption* destroys the lung substance, caused principally by impure air and the best remedy is to remove the cause by plenty of pure, fresh air. *Diphtheria* is a disease of the mucous membrane of the throat, producing a stiffness of the membrane and exuding matter, which results frequently in blood poison and death. The remedy is Peroxide of Hydrogen used as a gargle. *Croup* is an inflammation of the larynx and trachea. Treatment should produce vomiting; use hot packs on the throat.

CIRCULATION is the system by which the blood is carried to all parts of the body. *Blood* contains the nutritious supply of the system; the quantity is about eighteen pounds to each person. *Plasma* is the liquid part and the corpuscles are the round disks in the blood. *Coagulation* is the hardening of the fibrin in the plasma, which stops bleeding. *Heart* is the engine which moves the blood. It contains four cavities, called auricles and ventricles. Tricuspid valves are on the right and bicuspid on the left side, with the semi-lunar at the opening of the aorta. Pulmonic circulation takes the blood to the lungs, systemic from the heart to all parts of the body. *Arteries* carry the blood from the heart, while veins carry the blood to the heart. *Capillaries* are hair-like tubes connecting the arteries and veins. The entire circulation is made in about two minutes. *Temperature* of the blood is 98 degrees, which is maintained by oxygen, received in the lungs and regulated through the pores of the skin. *Lymphatic* circulation is a system by which fatty tissue is carried back into the blood, and foreign substance is absorbed through the skin.

DISEASES.—*Congestion* is an unnatural accumulation of blood. *Inflammation* is continued congestion and obstruction of the flow of blood. Treatment should be cooling applications. *Bleeding* from an artery is indicated by red blood in jets; from a vein, dark blood. Compress the

artery next to the heart, and away from the heart, in case of a vein. *Scrofula* is a disease of the lymphatic glands and may be prevented by dieting, ventilation, and proper care. *Cold* is caused by chilling the skin, closing the pores and stopping perspiration. Treatment should be sweating. *Alcohol* in small quantities increases the circulation; when undiluted it poisons and kills. It paralyzes the capillaries and congests the membranes. Its affinity for water hardens the tissues and weakens their action. It checks the absorption of oxygen in the lungs and renders its users more susceptible to epidemics.

FOOD AND DIGESTION.—*Food* is any substance that can be assimilated by the body, by which the wornout tissues are renewed. *Nitrogenous* food includes meat, eggs and cheese and builds up muscle. *Carbonaceous* food includes potatoes, corn and starch. *Mineral* food includes water, holding in solution, iron, sulphur, magnesia, phosphorus, salt and potash. Three pints of water are required daily and forms two-thirds of the body. *Digestion* prepares the food for assimilation. *Mastication* is cutting, grinding, moistening and mixing the food with saliva. *Gastric* digestion is performed by the stomach, which consists of three coats: outer serous, middle muscular and inner mucous, which secretes the gastric juice. *Cardiac* orifice is the upper opening, and *Pylorus* the lower. Pepsin is the chief ingredient of the gastric juice, which dissolves albumen and changes the food into chyme. *Intestinal* digestion is dissolving the oils and fats in the small intestines, by the aid of the bile, pancreatic juice and intestinal juices, changing the food into chyle. *Absorption* is the sucking up of the chyle by the lacteal vessels and veins. Portal vein passes from the stomach to the liver. *Hygiene*—Different foods vary in their nutritious properties and ease of digestion. *Stimulants*—Coffee is stimulating and nutritious when taken with milk and sugar. Tea tends to coagulate albumen and delay digestion. In moderate quantities they are harmless to adults, but should not be used by children. Food should be well cooked and we should avoid rapid eating. Quantity and quality should be regulated by age, season and climate.

DISEASES.—*Dyspepsia* or indigestion caused by abuse of the digestive organs may be treated by tonics. *Mumps* is a swelling of the parotid gland and is epidemic. It should run its course, but the suffering may be alleviated by hot packs. Alcohol hinders digestion by precipitating the pepsin and coagulating albumen. It is carried to the liver and affects the bile, causing fatty degeneration of the liver. It has a similar effect on the kidneys, and checks the waste of the system. It creates an appetite for itself, which is not noticed in appetites for food. *Dipsomania* is a hereditary appetite for alcohol.

NERVOUS SYSTEM includes the brain, spinal cord and nerves. *Nerve* tissue is composed of white and gray matter. In the brain the white

matter is on the interior and in the nerves on the exterior. *Brain* is the seat of nerve force. It is wrapped in thin membranes. The *Cerebrum* is the front part, divided into parts connected by fibers, and is supposed to be the seat of intelligence. *Cerebellum* is in the back part and is supposed to control the movements of the body. *Medulla Oblongata* is an enlargement of the spinal cord. *Nerves* are the white cords permeating every part of the body: they consist of white matter on the exterior, which transmit motion, and gray matter on the interior, which transmit sensation or pain. *Pain* is located in the brain; Spinal nerves branch off from the spine; Cranial from the brain and Medulla: Sympathetic nerves connect the vital organs. *Reflex* action changes a sensation into motion before it reaches the brain. *Sleep* is a semi-conscious condition, in which the body relaxes many of the forces, while others continue. Five to eight hours are required for sleep. Sunlight is essential to nerve health. The brain is 80 per cent. water and within itself insensible. *Alcohol* has a special affinity for the brain, by first exciting, followed by muscular weakness, then mental weakness, resulting in unconsciousness. Its excessive use will induce innumerable diseases. *Tobacco* is composed of carbonides, ammonia and nicotine. Carbonides produces sleep, ammonia bites and nicotine is a deadly poison. It causes vomiting, irritates the nerves, causes many diseases; as throat and lung troubles, nervous disorders and injuriously affects the senses. It retards the growth and development of children using it. *Opium* is an extract from the poppy, which excites, followed by depression. *Chloroform* is an anæsthetic rendering the user unconscious to pain, and creates an appetite for itself which leads to death.

SPECIAL SENSES are the avenues through which we become cognizant of external things. *Touch* is that sense, located in nearly all parts of the body, by which we obtain impressions of form, solidity and temperature. It is located in the papillae of the skin, and is susceptible of wonderful cultivation, as shown in the blind. *Taste* is the sense by which we obtain flavors and is located in the tongue; different parts of the tongue being sensitive to different flavors. Its natural use is to guide in the selection of food and is susceptible to great cultivation. *Smell* is the sense by which we perceive odors and is located in the olfactory nerve in the nose. Its use is to aid in selecting food and avoiding bad air. *Hearing* is located in the ear, which is divided into external, middle and internal ear. The drum is a membrane between the external and middle ear. A chain of bones rests against the drum of the middle ear and connects with the semi-circular canals of the internal ear, which is filled with a fluid and other substance, through which sound is transmitted to the brain. *Sight* is the sense by which we perceive light, color, form, size, distance, location, and various properties of matter. The organ is the eye, the parts of which are the sclerotic coat, cornea,

choroid coat or black lining, retina, or picture screen, the crystalline lens, aqueous humor, vitreous humor, iris and pupil. *Lachrymal* glands are located above the eye and furnish a fluid for washing the eye, which is drained off into the nose. The lens is adjusted to suit the distance of the object. Near and far-sighted are defects in the lens or shape of the cornea. Color-blindness is a deficiency in color sensation. Hygiene—Avoid fine print in a dim light, reading on a train, and with a light directly in front. Avoid rubbing the eye when objects get into it, but turn the lid back over a match and remove the object. Don't use eye-washes. Consult a physician in case of granulation.

CONCLUSION.—*Health* is the harmonious condition and action of all the organs and tissues of the body. *Disease* is a disordered condition and not the presence of an evil spirit. It may be prevented by knowing, and observing or obeying the laws of health and using medicines to aid nature in repairing the injury. Sanitary and hygienic measures are of far more value than medicines. *Disinfectants* counteract the effect of disease germs. The best known are sulphur fumes, solution of sulphate of zinc, salt, copperas and chloride of lime. *Poison Antidotes*—*Acid* poison, use soap suds, magnesia or lime, followed by warm water and flax tea. *Alkali* poison—use vinegar or lemon juice, followed with oil or cream. *Arsenic*—use white of egg. *Bites*—use suction, lunar caustic or burn. *Copper*—use eggs or soda. *Laulanium*—use epicac, mustard or warm water to produce vomiting. *Lead*—use anything to produce vomiting, followed by Epsom salts. *Matches*—use magnesia, chalk and mucilaginous drinks. *Mercury*—use milk, eggs and flour water freely. *Prusic acid*—use a teaspoonful of hartshorn in a pint of water. *Green vitrol*—use epicac and mustard, followed by magnesia.

METHODS.—Teach primary pupils laws of health and principal parts of the body. Teach the mental, moral and physical effects of tobacco and alcohol. Use the outline and topic methods mentioned with other studies. Have pupils make original drawings or copies, naming the parts illustrated. Have parts pointed out on the charts and described. Give special attention to diseases and simple treatment.

HISTORY.

In the study of history two objects should be kept in view: Fact get-and thought development. The success of one depends on the other. Instructions should be given in such a way as to store the mind, with useful information, increase mental power, arouse patriotism and make good useful citizens.

It should be studied as a whole, by eras, by periods, by topics and in detail.

HISTORY is a record of events given in a chronological order. *Anti-diluvian* history includes events prior to the deluge. *Post-diluvian* history includes events since the flood. *Christian* era includes events since the coming of Christ. *Scientific* history is the story of Geology. *Sacred* history is the story of the Bible. *Profane* history is obtained from other sources than the Bible. *Traditional* history is the unwritten story handed down from father to son, or generation to generation. *Written* history is given in books, including the facts written at the time they occurred. *Ancient* history includes all events prior to the fall of the Roman empire (476 A. D.) *Mediæval* history includes events from the 5th to the 15th century. *Modern* history includes events from the discovery of America to the present time.

ERA OF PREPARATION, includes events from 1492 to 1775. Including the Periods of Exploration 1492 to 1607; Period of Colonization 1607 to 1689; Period of Unification, 1689 to 1775.

ERA OF FORMATION, 1775-1829. Including Period of Separation, 1775-1783; Period of Organization, 1783-1789; Period of Nationalization, 1789-1829.

ERA OF REFORMATION, 1829-1892. Including Period of Agitation, 1829-1861; Period of Emancipation 1861-1865; Re-Nationalization 1865 to the present.

TERMS to be mastered: *Exploring* is passing over for the purpose of discovery. *Discovery* is first finding what already existed. *Colonizing* is a number of persons settling in a new place, under some form of organization. *Charter* was a written permit from a government to a colony, granting certain territory, privileges and protection. *Royal Province* was the territory granted by the charter and was under the government of England. Conflicting claims caused much trouble between the different colonies and nations making settlements.

ABORIGINES included the *Mound Builders*, who occupied this country before the Indians: as shown by the numerous mounds left in the Mississippi valley. *Indians* succeeded the Mound Builders, and were inferior to them in civilization. They possessed but few arts and made no progress. Had no domestic animals and considered labor degrading, except for the squaws, who built the wigwam, carried the wood, while the men engaged in sports. In disposition, he was cruel, treacherous, lazy, and an inveterate gambler. He could endure great fatigue and the most horrible torture without a sign of suffering. His religion was of a low order, while not idolatrous, he feared the spirits of the animals he killed. The Indians are opposed to civilization and are doomed to destruction, except those willing to become civilized.

NORTHMEN were explorers from Norway and Sweden, who claimed to have explored the east coast of this country during the 10th century. They were Hurjulfson and Lief Erickson.

1492 — ERA OF PREPARATION.— 1775.

DISCOVERIES.—Columbus discovered San Salvador, 1492; John Cabot Cape Breton, 1498; Amerigo Vespuccius, South America, 1499; Ponce de Leon, Florida, 1512; Balboa, Pacific ocean, 1513. Magellan circumnavigated the earth, 1517-21. *Explorers*—Cortez explored and conquered Mexico, 1521; De Soto, the Southern part of the United States, 1540; Hudson, Hudson bay, 1610; Cartier the St. Lawrence river, 1635; Jesuit priests the Mississippi river, 1673-82.

The above are the principal discoveries and explorations of most importance to be fixed in the mind, around which, may be gathered and properly associated the less important details. First the fact; second the cause; third the result.

SETTLEMENTS.—Columbus, Hayti, 1493; Balboa, Darien, 1510; Jesuits, Arizona, 1560; Melendez, Florida, 1565; Espejo, New Mexico, 1582; Smith, Jamestown, 1607; Pilgrims, Plymouth, 1620; Dutch, Manhattan Island, 1623; Roger Williams, Rhode Island, 1636.

COLONIAL PERIOD.—*Forms of Government:* *Royal Province* was controlled by a governor appointed by the king. *Charter* government was a written charter from the king, under which the people governed themselves. *Proprietary* was that form in which owners of the territory governed. *Commercial* association was a company controlling for financial profit. *Voluntary* association was a form in which the colonists made and executed their own laws.

VIRGINIA.—Settled by London Co. 1607, with an idle, adventure-some class. The object was financial gain. Religion was the church of England. Events—The starving time, 1609; Marriage of Pocohontas, 1613; House of Burgeses, 1619; Slavery introduced, 1619; Navigation Acts, 1631; England controlling the commerce of Virginia; Bacon's rebellion against Governor Berkeley, which resulted in the burning of Jamestown and the recall of Berkeley, 1676.

MASSACHUSETTS.—Settled at Plymouth, 1620 by Pilgrims, a sober, industrious and religious class, opposed to the church of England, and fleeing for religious and civil freedom. Government was a voluntary association. Events—Establish Thanksgiving, 1621; Banished Roger Williams, 1636, for free thought; Established Harvard College, 1636; First printing press, 1639, and free schools, 1647; Persecution of the Quakers, 1656-61, for refusing to take an oath, pay taxes, rejecting religious forms, etc.; King Phillip's war, 1675-6, which cost the colony 600 lives and a half million dollars; Salem witchcraft, 1692, was a superstitious idea that people were placed under the control of others, by power given them by the devil. Several were put to death.

NEW YORK—1623, at Manhattan Island, by West India Co. The colonists were honest, thrifty and religious, who came to make a home

in a free land. Their religion was Lutheran. Events—Surrendered to the English. 1664; Established the freedom of the press 1734, giving the people the right to openly criticise the government; Negro plot 1741, was a suspicion that a plot had been formed to subdue the whites. Four white men and eighteen negroes were hanged for being suspected.

MARYLAND.—1635, by English Catholics, lead by Cecil Calvert. Events—Claybourne's rebellion. 1635-45; a fur trader who refused to submit to the authority of Lord Baltimore; Civil war, 1655, occurred between the Protestants and Catholics. In a battle about fifty Catholics were killed. Two governments were sustained for a while, when religious toleration was restored.

PENNSYLVANIA—1682, by English Quakers, led by William Penn. The great law required voters to be Christians and prohibited religious persecution; gave great power to the people. Penn made a treaty with the Indians by buying their lands and dealing with them justly.

CAROLINAS—1650-70, by English from Virginia. The Grand Model, a form of government by John Locke, adapted to an aristocratic people but proved a dead letter among a Democratic people. The government being proprietary and oppressive, proved unsatisfactory and the colonies divided in 1729, when they became Royal Provinces.

GEORGIA—1732, by James Oglethorpe, an English officer and persecuted Christians from the old countries. They were governed by trustees who limited a man's farm, prohibited women from inheriting land, and the importation of rum and slaves. The government proved unsatisfactory and it became a Royal Province.

COLONIAL WARS.—KING WILLIAM'S WAR—1689-97. Cause: By war between England and France, which caused a conflict between the colonies, as to territorial claims. Events—Indian ravages, expedition against Quebec and capture of Port Royal. Closed by treaty of Ryswick leaving territory unchanged.

QUEEN ANNE'S WAR—1702-13. Cause: Violation of the treaty of France proclaiming son of James II King of England. Result: England gained Acadia and the Newfoundland fisheries by the treaty of Utrecht.

KING GEORGE'S WAR—1744-48. Cause: Death of the king of Austria, which unsettled the balance of power and unsettled territorial claims. An invasion of Canada was made and the war closed by the treaty of Aix la Chapelle, leaving territory unchanged.

FRENCH AND INDIAN WAR—1755-63. Cause: Settling the Ohio valley. Events: Expeditions against Acadia, Fort DeQuene, Niagara, Ticonderoga, Louisburg and Quebec. English commanders: Braddock, Shirley, Abercrombie and Washington. French: Dieskau and Montcalm. War closed by treaty of Paris. The French surrendering Canada to England and all territory east of the Mississippi. The territory west of the Mississippi to Spain. Spain ceded Florida to England. The war cost

the colonists thirty thousand men and eleven million dollars. The war bound the colonies together. England undertook to tax the colonies to pay the expense of the war, which resulted in the

1775 — ERA OF FORMATION.— 1829.

WAR OF THE REVOLUTION—1775-83. Cause: Oppression and Taxation without representation. Independence declared by the Continental Congress, July 4, 1776. The battles were Lexington, Ticonderoga, Bunker Hill, Siege of Boston, Long Island, Princeton, Burgoyne's invasion, *Saratoga*, Brandywine, Monmouth, Savannah, Camden and the Siege of Yorktown. American commanders: Parker, Prescott, Putnam, Washington, Stark, Gates, Greene, Lincoln, Marion and Arnold. British: Howe, Clinton, Rall, Baum, Burgoyne, Cornwallis, Tarleton and Rawdon. Paul Jones gained several naval victories for the Americans. Americans received aid from France. War closed by treaty of Paris, England acknowledging the Independence of the United States, fixing boundaries. Cost England, 50,000 men and \$610,000,000; United States, 40,000 men and \$135,000,000.

CONSTITUTIONAL CONVENTION met at Philadelphia, 1787. Articles of Confederation found insufficient. Washington presided at the convention. Adams, Hamilton, Madison, Morris, Franklin and Randolph were the active leaders. Madison framed the Constitution, which was adopted by the convention and ratified by the thirteen states.

ADMINISTRATION OF WASHINGTON AND ADAMS—1789-97. Party, Federal. Events—Organization of cabinet and judiciary; Tariff act passed; Adopt first ten constitutional amendments; Locate capitol at Washington, 1790; Establish mint and national bank; Naturalization period fixed at five years. Cotton gin invented; Franklin dies, 1790; Jay made a treaty with England, agreeing to pay debts due them without forbidding the impressment of American seamen. While the treaty was approved by the Senate it was unsatisfactory to the people.

ADAMS AND JEFFERSONS—1787-1801. Party, Federal. Issue, Jay's treaty. Events—Navy created, 1798; Alien and Sedition laws passed; Naturalization period fixed at fourteen years; Eleventh amendment adopted; Washington dies, 1799; Treaty made with Napoleon, 1800.

JEFFERSON, BURR AND CLINTON—1801-9. Party, Republican. Issue, Alien and Sedition laws. Events—First message to Congress; Army and navy reduced; Tax taken from whisky; Naturalization fixed at five years, 1798; West Point academy established 1802; Ohio admitted; Louisiana purchased, 1803; Hamilton and Burr duel, 1804; Twelfth amendment passed; Tripolitan war, 1801-6; National road established; Embargo act passed; Burr tried for treason; Steamboat invented, 1807; Importation of slaves prohibited, 1808.

MADISON, CLINTON AND GERRY—1809-17. Party, Republican. Issue,

War with England. Events—Battle of Tippecanoe; War of 1812, which was caused by the impressment of American seamen and included the battles of Queenstown, Perry's victory on the lakes, Lundy's Lane, Fort Erie, Burning of Washington and the Battle of New Orleans. War closed by the treaty of Ghent, 1814. Result: The National debt increased \$127,000,000, business injured, but factories were built and the U. S. gained a standing among nations. War with Algiers, 1815; Tariff act and national bank established; Louisiana and Indiana admitted, 1816.

MONROE AND TOMPKINS—1817-25. Party, Republican. No issue. Events—Purchase of Florida, 1819; Missouri Compromise, admitting Missouri as a slave state and limiting slave territory, 1820; Monroe doctrine, agreeing to non-interference with the old world, and objecting to foreign powers subduing any portion of the American continent, 1823; Tariff of 1824.

PARTIES—The *Democratic* party favored State sovereignty and economy; opposed national banks and internal taxation, and was strict in the construction of the constitution. Leaders—Franklin, Jefferson, Madison, Monroe, Burr and others. *Republican* party advocated public improvements at national expense, a protective tariff, and favored national banks. Leaders—Clay, Adams and Webster. Anti-Masonic party opposed all secret societies and urged their suppression by law.

J. Q. ADAMS AND CALHOUN—1825-29. Election by the House. Party Republican. Issue not defined. Events—Erie canal opened, 1825; John Adams and Thomas Jefferson die July 4, 1826; First railroad, 1826; Protective tariff bill passed, 1828; Webster's dictionary published, 1828.

1829 — ERA OF REFORMATION.—1892.

JACKSON, CALHOUN AND VAN BUREN—1829-37. Party, Democratic. Issue, Tariff, national bank and internal improvements. Events—Postmaster General member of the cabinet; Changes in the civil service; Mormon church organized, 1830; Nullification act of S. C., 1831; Clay's compromise bill, 1833; Veto of National bank bill, 1832; Black Hawk war; 1832; McCormick reaper invented, 1834; Monroe and Madison die, 1831-36; Arkansas and Michigan admitted, 1837-39.

VAN BUREN AND JOHNSON—1837-41. Party, Democratic. Issue, National banks. Events—Financial panic, 1837; Seminole war; Telegraph patented, 1837; Sub-treasury bill passed, 1840.

HARRISON AND TYLER—1841-45. Party, Whig. Issue, National banks and a protective tariff. Events—Harrison died April 4, 1841; Sub-treasury bill repealed and national bank bill vetoed; Bankrupt law passed; Boundary line of Maine established; Tariff bill passed, 1842; First message sent by telegraph, 1844; Texas annexed and Florida admitted as a State, 1845.

POLK AND DALLAS—1845-49. Party, Democratic. Issue, Annexation of Texas. Events—Mexican war, caused by the annexation of

Texas, and fixing the boundary line; Battles were fought at Fort Brown, Palo Alto, Monterey, Buena Vista, Cerro Gordo and Mexico. Santa Anna was the Mexican commander. American commanders were Scott, Taylor, Fremont, and Kearney. War closed by the treaty of Gaudalupe Hidalgo, making the Rio Grande river the boundary and ceding California and New Mexico to the United States for \$15,000,000. Howe sewing machine invented, 1846; Gold discovered in California in 1848.

TAYLOR AND FILMORE—1849-53. Party, Whig; Issue, Slavery. Events—The death of Taylor, 1850; California admitted without slavery, 1850; Postage reduced to three cents, 1851; Clay and Webster die, 1852; Slavery restricted in the District of Columbia; Underground railroad transferring runaway slaves to Canada, 1852.

PIERCE AND KING—1853-57. Party, Democratic. Issue, Omnibus bill, which killed the Whig party. Events—Kansas and Nebraska bill, leaving the question of slavery to the territory being admitted. Gadsden purchased of Mexico a large tract of territory for \$10,000,000; Perry makes a treaty with Japan, 1854; A civil war breaks out in Kansas, 1854; The new Republican party is formed in opposition to slavery extension—Know Nothing party favored native born citizens for office, naturalization period twenty-one years, and the Bible to be kept in the public schools.

BUCHANAN AND BRECKENRIDGE—1857-61. Party, Democratic. Issue, Extension of slavery. Events—Dred Scott decision, by which slaves were held in free territory. Personal liberty bills were passed by some states, giving fugitive slaves a trial by jury. John Brown of Kansas, captured armory at Harper's Ferry, 1859. He was overpowered and executed. Minnesota, Oregon and Kansas were admitted. South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, Texas, secede and organize the Confederacy, 1861.

LINCOLN AND HAMLIN—1861-65. Party, Republican. Issue. Opposed extension of slavery. Events: War of the Rebellion; 1861-65; Causes—Immediate, Secession; Remote, Different construction of the constitution, system of labor and lack of intercourse. Union chief commanders were Scott, Halleck, McClellan and Grant. Confederate, Lee. Events: Firing on Fort Sumpter April 12, 1861; Virginia and Arkansas secede; Battles of 1861 were Bull Run and Wilson Creek; 1862, Merrimac and Monitor. Fort Donaldson, Shilo, Perryville, Corinth, Murfreesboro, Richmond, Lee's invasion, Fredricksburg. 1863, Emancipation Proclamation, Gettysburg, Vicksburg, Chickamauga; 1864, Wilderness, Petersburg, Sherman's march. 1865, Richmond falls; Lee surrenders to Grant, which closed the war.

Leading Union generals were Butler, Lyons, Burnside, Fremont, Buel, Meade, Hooker, Sherman, Thomas, Sheridan, Logan, and many others. Confederate generals were Bragg, Jackson, Johnson, Longstreet, Smith,

Beauregard and others. Results—Cost nearly a million lives and \$2, 750,000,000. Slavery was abolished and the Union preserved. The war was carried on by means of paper money called greenbacks, which depreciated to 36 per cent. of the face value in gold; or in other words gold was worth \$2.80 in paper. The Confederacy used paper money, which became worthless at the close of the war and their debt will never be paid.

JOHNSON—1865-9, after Lincoln's death, April 14, 1865. Party, Republican. Issue, Management of the war. Events—Amnesty proclamation pardoning rebels; Ratification of the 13th amendment, abolishing slavery; Johnson's reconstruction policy: repealing articles of secession, repudiating the confederate debt and ratifying the thirteenth amendment, re-admitted the seceded states. Congress required the ratification of the fourteenth and fifteenth amendments, and kept them under military rule until they complied. Atlantic cable laid, 1866; Alaska purchased for \$7,200,000; Johnson impeached for violation of Tenure of office bill. Fourteenth amendment ratified: defining citizenship, disqualification of representatives and the validity of the public debt.

GRANT, COLFAX AND WILSON—1869-77. Party, Republican. Issue, Negro suffrage and relations with seceded states. Events—Union Pacific railroad opened, 1869; Fifteenth amendment ratified, giving the negro the right of suffrage, 1870; Chicago fire, 1871; Geneva arbitration allowing the Alabama claims to the U. S. of \$15,000,000, 1872; Invention of the telephone, 1873; Salary act, and Panic of 1873; Silver demonetized, making gold the standard, 1873; Centennial Exposition, 1876; Electoral Commission to decide the Presidential election, 1877.

HAYS AND WHEELER—1877-81. Party, Republican. Issue, Southern policy and resumption of specie payment. Events—Removal of U. S. troops from the South; Railroad strikes, 1877; Edison invents the phonograph, 1877; and electric light, 1879; Grant makes a tour around the world, 1879; Gold and paper currency at par. Silver bill passed making silver a legal tender, 1878.

GARFIELD AND ARTHUR—1881-85. Party, Republican. Issue, Protective tariff. Events—Star route frauds discovered in the mail service, in which fictitious contracts were made; Garfield assassinated by Guiteau, 1881; Longfellow and Emerson die, 1882; Polygamy prohibited; Brooklyn bridge completed, 1883; Postal notes introduced; Postage reduced to two cents; Civil service bill passed; Washington monument completed, 1885.

CLEVELAND AND HENDRICKS—1885-89. Party, Democratic. Issue, Tariff reform. Events—Grant, McClellan and Hendricks die, 1885; Bartholdi statue erected; Natural gas used as fuel; World's fair at New Orleans; Hancock, Logan, Seymour, Tilden, Arthur and Wheeler die, 1886-7; Interstate commerce bill passed; Beecher, Conklin and Sheridan die, 1887-88; Department of Agriculture created, 1888; Dakotas, Montana and

Washington admitted, 1889.

HARRISON AND MORTON—1889-93. Party, Republican. Issue, Tariff. Events—Oklahoma opened; Johnstown flood; Pan American congress, composed of representatives from all the governments of the countries of North and South America; Idaho and Wyoming admitted; Silver bill passed increasing the purchase of silver bullion; McKinley tariff bill, readjusting the tariff and placing sugar and other articles on the free list, 1890; General Belknap, Justice Miller and Bradley, Secretary of the Treasury Windom, and Bancroft the historian, die, 1891.

CENTURY OF PROGRESS.—Declaration of Independence, July 4th, 1776. Thirteen states with three millions of people has grown to forty-four states with a population of sixty-four millions. Invention has given us the lightning rod, cotton gin, steamboat, telegraph, telephone, reaper, electric light, Atlantic cable, sewing machine, electric railways, phonograph, and thousands of other useful inventions. Production in the way of agriculture and manufacture, has been the great wealth producing force which has furnished the millions of laborers employment, by which the country has attained great wealth. Transportation in the way of railroads and rivers, which reach every nook and corner, has distributed the products and justly equalized the wealth. Intellectual progress has been fostered by free public schools, the newspaper, colleges and the public library. While the American institutions and people are not without fault, which will be corrected by succeeding generations, it may be truthfully stated that a more just, upright, prosperous and happy people does not exist on the face of the earth.

METHODS.—*Outline* method divides the subject into divisions and subdivisions, and arranges them in the order of their importance. *Topical* method is similar to the outline method, giving each pupil a special topic to study and recite. The *Catechetical* or Quiz method is asking questions to bring out the story of the lesson. It may be used to aid in the other methods but should not be used exclusively.

AIDS.—Have a variety of text books. Draw maps and locate places; Write essays; Group and associate names and dates. Make time the background of the historic picture. Have two lessons—one on the geography, the other on the fact. Have frequent reviews by class asking questions. Allow approximate dates, and group around some important date. Teacher give the date, and pupil name the event; and vice versa. Choose sides and ask and answer questions. Spell and pronounce historic names and terms. Discriminate and group facts by their importance. Express a thought of some event and allow pupils to name the event. Teach cause and effect of each event as far as possible. Give but little attention to unimportant details. Send the dull ones ahead occasionally to make discoveries. Interest pupils in the manners and customs, schools, houses, homes, food and dress of the people.

DIDACTICS.

DIDACTICS OR PEDAGOGY is the science or art of teaching, or developing children into worthy manhood and womanhood.

PRINCIPLE of teaching is a law based upon conditions of the minds of those to be taught: 1. Any power may be developed and trained. 2. Powers are cultivated by wise use. 3. Active powers must be trained first.

ORDER OF EDUCATION: 1. Train the child to perceive, by cultivating sense perception. 2. Proper expression in words. 3. Learn by doing.

METHOD is simply the manner of presenting a subject.

EDUCATION is the development of the faculties, or germs of power in man, and the training of them into harmonious action, in obedience to the law of reason and morality.

GENERAL EDUCATION has for its purpose, to make of the child given, the best possible specimen of a man or woman. *Special* education is the acquiring of some art, trade or profession. *Physical* education pertains to the development and training of the physical powers of the body, *Moral* education pertains to moral principles. *Intellectual* education treats of intellectual powers.

EDUCATIONAL MAXIMS: "Know thyself. The proper study for mankind is man. Train children to observe, to do, and to tell. Read, observe, reflect and note your thoughts. Knowledge is a means, education an end."

SCHOOL MANAGEMENT is giving attention to details; as, lining and marching pupils out at intermissions; Teaching them how to sit, stand and walk; To stand when reading or answering a question, without leaning against the desk or wall; To distribute writing material in an orderly manner. Insist on habits of neatness, cleanliness and punctuality. Allow no leaving of seats without permission. Pupils should have a uniform method of doing their work. You should have close supervision over the yard, prohibiting rough play and encouraging suitable games. Be sociable with pupils while playing and allow full freedom in proper directions. Keep a position in which you can be seen by all the pupils. Avoid as far as possible taking hold of pupils to put them in position. Avoid scolding and many demerit marks; but cultivate a desire to overcome evil tendencies. Avoid punishing trifles too severely; but ascertain the motive and treat accordingly. Don't allow pupils to whisper in helping each other, but teach that it is full of evil and develop a senti-

ment against it. Don't allow romping in the school room at any time, but encourage out door exercises. Avoid appealing to higher power, as it weakens the respect your pupils have for your authority. Don't confound giving information with tale-bearing, but encourage pupils to give information the same as courts require of citizens and witnesses. You should never be late, if you expect your pupils to be punctual. Always give a suggestion in preference to a command. You should have a talk with the parents of troublesome pupils, but don't dispute with them or make any spiteful remarks.

DISCIPLINE—Order is the first essential; don't try to teach without it. It is not absolute quiet, but broken by the hum of work. Secure order by appearing profound and mysterious; impress your pupils that you are master of the situation. Avoid over-indulging pupils or startling them into order by loud commands, to drown the noise. Avoid calling for order in general terms. Have but few rules and those plain and to the point. "Do Right" should be the fundamental rule. Avoid a high-keyed tone; Speak gently or your pupils won't give attention. Work off pupils surplus force by a short physical exercise. Govern through the eye as much as possible by a look. Avoid permitting an act one day and prohibiting it another. If possible develop an order that will exist in your absence. Avoid suspecting pupils of a desire to violate rules, and never ridicule pupils. Always explain to a pupil why you punish him or her, and avoid whipping except as a last resort, and then never whip a girl. Never pull a child's ear or slap his cheek.

METHODS.—Avoid questioning in rotation, and put your question in such a way as to lead your pupils to think. A pupil should not know what his question is to be beforehand. Avoid repeating questions. Do your teaching when assigning the lesson, by calling the pupils' attention to the different points and explain how to master them. Avoid continuing the lesson too long, but close in the midst of great interest, and review a little each day of some preceding lesson. Don't mistake repetition for comprehension, or that detecting errors is correcting them. Avoid trying to teach too many points in a single lesson, or measuring your progress by pages canvassed. Drill when three facts have been given. Be definite in your teaching; point directly to the subject, giving your dull pupils an equal, if not a better chance, than the apt ones. Avoid giving young pupils information they cannot use. Use objects in teaching but not in drilling. Require complete answers in complete sentences, and avoid repeating answers after pupils, or doing too much talking, by using unfamiliar words to the pupil, while teaching. Lead pupils to find out for themselves, just as much as possible. The more a pupil does for himself the more he becomes educated. Encourage self-activity, by leading pupils to discover, instead of telling them, and thus deprive them of the best part of the work.

SECURING A SCHOOL.—Secure a certificate, and a list of probable vacancies from the County Superintendent. Visit the directors in person and convince them that you are competent to take charge and teach a successful school. Make a contract and secure board in the best family possible. Learn the peculiarities of the neighborhood and school. Obtain Classification Register and study it. Make your first day your best, by having everything ready. Secure full and regular attendance by visiting parents and get those to attend, who have dropped out of school, having lost interest.

IN CLASSIFYING, follow the Course of Study furnished, making reading the basis. Place pupils of the same grade in the same classes, whether they have books or not; and drill them daily, until you have created sufficient interest to demand the books. You should not neglect to give the number, language, geography and general lesson to each grade as required in the course of study. You will find a daily program in the course of study, which should be modified to suit the peculiar needs of the school.

APPARATUS includes blackboard around the entire room, globe, maps, reading and Physiological charts, crayons, Unabridged Dictionary, buckets, wash-basin, towels, soap, mirror and comb. A set of books on teacher's desk and a case in which to keep apparatus. More apparatus is destroyed by neglect than is worn out by proper use. It would be best for teachers to own their own tools as far as possible. Much of the apparatus can be made by teachers, by using manilla paper and crayon.

VENTILATION.—When not furnished with registers, lower all the windows at the top slightly, and keep the temperature near 70 degrees. Have some pupil look after the fire, thermometer and ventilation, and keep it even. Have all pupils leave the room during recess in fair weather, and give the room a complete airing.

GENERAL SUGGESTIONS.—Give special attention to the halls, vestibules and see that they are kept neat and clean, and furnished with hooks, shelves and other needs, for all these things educate. You should not fail to look after the grounds and outbuildings, for their condition is frequently such as to be degrading. If foul, report the condition to the director immediately and require his prompt attention. Hold pupils responsible for damages when done purposely.

DAILY PREPARATION.—You should prepare each lesson before assigning it. This may be done from outlines. The order of the recitation should be a review of the preceding lesson; recitation of the present lesson; discussion of the coming lesson.

GENERAL EXERCISES.—Always open school by singing a suitable song. If pupils are not supplied with books, copy song on board and have pupils copy. Teach pupils the kind, length, pitch, and position of notes and cultivate their tones by singing the scale and cords, prolong-

ing tones, loud and soft, until they produce sweet musical tones. A new sentiment should be committed each day by the school. Have quotation roll call frequently. Have pupils report items of news that would be of interest to all. Occasional drills on local government are of great value and should not be neglected. Talks or reading from some book on elementary science is a very practical exercise for Friday afternoon.

MENTAL SCIENCE should be a continuous study by every teacher that they may be able to properly understand, develop and train the minds of those placed under their charge. The following definitions and outlines are intended to give a general view of the subject, which should be followed by a course of reading and observation.

MENTAL states or activities are: 1. *Consciousness*, the power by which the mind knows its own acts or conditions. 2. *Attention*, the power by which the mind directs voluntary thinking to one subject. 3. *Conception*, the power by which an absent object becomes an object of thought.

INTELLECT is the knowing power, and includes 1. The *Perceptive* powers, which gather knowledge; 2. The *Representative* powers, which store knowledge; 3. The *Reflective* powers, which examine knowledge. *Perceptive* powers include the senses, which perceive and make discriminations in the form, quality and other properties of objects. *Representative* powers include *Memory*, which holds concepts of absent objects as they are or were, including *Recollection*, which calls them up again. *Recognition* is knowing that you have known it before. Attention, association and arrangement is the order of developing the memory. *Imagination* presents things as they might be. Reading, geography, history and poetry are proper studies for developing the imagination. *Reflective* powers include: 1. *Comparison*, which deals with the relation of things as to size, length, position, density, value, purpose, cause, effect and agreement. 2. *Abstracting*, which is thinking of a quality or property, apart from the object. 3. *Reason*, which includes the operation of forming a judgment, by comparing two propositions from which a third proposition is deduced, called the conclusion or judgment. *Inductive* reason discovers properties common to a class. *Deductive* reason assigns objects to classes by common properties. Reason may be developed by mathematical analysis. *Judging* is noting the operations of reason. *Generalizing* is grouping objects by a common quality and may be developed by the study of natural history.

SENSIBILITIES include the feeling powers; as, 1. *Desires*, which appropriate external objects to the gratification of some bodily or mental want. 2. *Appetites* are desires for food and sleep. 3. *Emotions* are feelings known, as beauty, sublimity, ludicrous, joy, melancholy, sorrow, grief, surprise, astonishment, wonder, dissatisfaction, disgust, modesty, shame, reverence and adoration. 4. *Propensities* are feelings referring to self-preservation, continued existence, desire for knowledge,

society, self-respect, esteem and to imitate. 5 *Affections* are feelings towards others. *Malevolent* affections include anger, envy, jealousy, revenge and fear. *Benevolent* affections include friendship, gratitude, sympathy, respect and love.

WILL is that power of the mind which chooses and executes the choice. The will acts in response to the feelings, which is usually excited to action by the intellect. *Stubbornness* is a lack of control of the will. Weak wills are vacillating and lack force. The will may be strengthened by exercises in thinking before willing, then remain firm. Stubbornness should yield to reason. Avoid antagonizing the will.

SCHOOL LAW.—The following points will be of interest to teachers: Teachers are not allowed to draw public money for time they teach without a certificate. Substitutes are required to have certificates. Directors are required to examine certificates before contracting. Contract must be signed and approved by the president of the board before school opens. Directors are required to visit the school twice during the term, and see that rules of the board are being complied with. Boards have full control over all the schools, directors and teachers, and may make rules and regulations governing teachers and officers. They may grant holidays, but teachers cannot demand it. Patrons may decide at the March meeting what branches shall be taught, or the board in case they fail to. Teachers are not required to teach any but common branches, unless authorized as above stated. The contract should specify what higher branches are to be taught; otherwise only the common branches are meant. Teachers must comply with regulations made by the county superintendent in making reports, following course of study and such other requirements in harmony with the school law. Teachers are required to teach the effects of alcoholic drinks, tobacco, etc., to all pupils. Indulgence in the use of the foregoing by the teacher, is questionable, and not in harmony with the spirit and intent of the law. School houses may be used for public meetings, if the director or board are secured against damages by parties using the house. Marking or defacing school property is subject to a fine or imprisonment. Teachers are held responsible for the preservation of school property under their care. Parties injuring school property are responsible for damages. Teachers teaching special branches are required to have certificate for the same. Teachers have control over their pupils on the road to and from school. They may suspend pupils for persistent disorder, until the director can be notified, who may dismiss the pupil for the term, by the approval of the president, except in independent districts, where it requires the approval of the entire board.

DRAWING.

The educational value of drawing, may be measured by the amount of active thinking it inspires in the mind of the pupil, and the power it develops in observing, comprehending and discriminating. All can learn to draw, except the blind, the idiotic, the lunatic and the paralytic.

DRAWING is the simplest, the most easily comprehended, and the strongest form of language, expressed by the combination of lines, tints and shades. The *Alphabet* consists of lines grouped by their form into straight, curved and irregular; by position into vertical, horizontal and oblique; by quality into light, medium and heavy. *Syllables* in drawing include angles; as right, acute and obtuse. *Words* are geometric figures; as the rectangle, square, rhombus, rhomboid, triangles (right, obtuse, acute, isosceles, equilateral and scalene), Polygons, including pentagon, hexagon and octagon; Circles, including ellipse, oval, crescent, lens, trefoils, quarterfoils and mixtilinear figures. The details of geometric figures, include base, apex, altitude, axis, diagonal, diameter, circumference, radius, semi-circle, arc, chord, segment, sector and quadrant.

SENTENCES are forms of solids or objects drawn in detail; as, the cube, sphere, hemisphere, spheroid, ellipsoid, ovoid, cylinder, half cylinder, circular, or square plinth, cone, frustrum of a cone or pyramid, prism and pyramid. Details of solids, include surface, face, edge, outline, corner and point.

A COMPOSITION in drawing is a correct representation of 'an object or group of objects or forms drawn in 'detail', corresponding to their appearance and association in nature. *Designing* is constructing and arranging geometric forms on a line, surface, or around a central point, after which they may be decorated by historical, geometrical forms, or conventional forms of leaves, flowers or plants. *Ornament* is any decoration or enrichment of form or color, or construction, intended to beautify the object. *Harmony* is a relation of parts forming a pleasing whole. *Field* is that part of the surface occupied by the design. *Fret* ornament, consists of lines broken into angles. *Rosette* is an arrangement radiating from a center. *Rhythm* is the frequent recurrence of the parts of the design. *Symmetry* is the proper proportion and position of parts forming a design. *Unity* is such a combination of parts as to form a pleasing whole. *Concentric* is having a common center. *Cross* composed of two bars arranged transversely, and is the symbol of suffering. *Circle* is the symbol of eternity. *Trefoil* is

three-lobed and the symbol of the Trinity. *Quarterfoil* consists of four lobes or foils, a symbol of the Evangelist.

The first aim in drawing is to teach pupils to see; that is to think of the parts and appearance of the thing at which they are looking. 2. To give skill to the hand in representing what is seen. 3. To teach form regular or geometrical and irregular or natural. 4. To give pupils the power to comprehend and use the art language.

CONSTRUCTION is that department of drawing which treats of the science and art of making diagrams or working drawings, showing all the facts of the thing to be made, as represented by the different faces, connected by dotted lines.

TERMS—*Position* is the relation of the dimensions to the horizon. The three positions are horizontal, vertical and oblique. *Location* is the relation to things surrounding; as right, left, front, back, middle, above, below, etc. *Surface*, all of the outside. *Face*, a limited surface bounded by edges. Faces have angles, while solids have corners. *Corners* are formed by faces. *Edge* is formed by the meeting of two faces. *Direction* refers to things having one dimension.—*Shape* to things having two dimensions.—*Solid*, to things having three dimensions. *Middle* is a location midway between two points. *Center* is a location midway between many points. *Bisect* is to divide into two equal parts. *Trisect* is to divide into three equal parts.

FORM is the expression to the eye of the appearance of an object. The three methods of expression are by making, by drawing and by language. The three methods of study are by sight, by touch and by placing or arranging. The three typical solids are sphere, cube and cylinder. The three points to examine are faces, edges and corners. Three facts to notice in each point are number, shape and position. Three motions are rolling, sliding and tumbling.

REPRESENTATION consists in making drawings representing objects as they appear from any position or view. Principles are: 1. Objects appear smaller as the distance increases. 2. Lines appear to shorten as the distance increases. 3. Parallel lines tend toward the same point, as they recede or go from the observer, and appear to meet at a point called, point of sight. Measurements may be taken by holding a pencil at arm's length, and slide the thumb and estimate the size. The part nearest should be measured and drawn first, followed by other points in the order of their prominence and nearness. Subjects suitable for study and practice, would be blocks, books and boxes in different positions and different distances away. Buildings may be studied and represented with their surroundings, trees, fences, etc. Never attempt to draw anything before studying every line, as to its position, appearance and direction. Problems should be formed with different objects in different positions and locations; as 1. Object in front, below the eye; 2. To the left, below

the eye; 3. To the right, below the eye. Form other problems on a level with the eye and above the eye. Practice sketching boxes open in different views, blocks with circular and square projections and indentures, and sections removed. A principle is of little use if not applied repeatedly.

LIGHT, SHADE AND SHADOW give relief, distinctness, solidity and emphasis. *Relief* makes an object stand out detached from the background. *Distinctness* is the quality of being plainly seen. *Solidity* is having the appearance of being made of something. *Emphasis* in drawing is making an object or idea conspicuous. *Shade* is the dark part of the object opposit the light, and is made by parallel lines, darker by parallel cross lines, and darkest, by blending with soft pencil or pen. *Shadow* is the form of the object in the path of the light and of the same degree of darkness, as the shade; being darker on nearing the point of intersection. *Reflections* represent the object in an inverted position. It may be studied by placing objects on a mirror, after which observe on water.

DECORATION is the science and art of producing beauty in ornament. *Beauty* is the harmony of differences. *Harmony* is that combination which pleases the eye. *Symmetry* is secured by balancing parts.—*Proportion* by equality of parts.—*Rhythm* by repetition of parts.

The order of study will be to make the type solids with clay, and objects like them. Cut forms from paper, representing their faces, and arrange them in borders along a line, in rosettes around a center, and draw the arrangements made. Geometric figures are used as units of decoration, which may be filled in with historic forms, as the Moorish ornament, Fleur-de-lis; Shield, Vase forms, Spiral curves, Arabesque ornament, Rosette, Greek Anthemion, Gothic ornament, Conventional forms of leaves and flowers. Ornamental units are unlimited.

COLOR being an important factor in all ornament, a knowledge of the subject is essential, since it opens a world of beauty, in which we may derive much pleasure, in recognizing and discriminating in color.

TERMS—*Scale* includes all the tones of any color, from white through a standard, or hue and its shade to black; as the red, blue and yellow scales. *Tone* is any one color of the scale. *Standard* is the key tone. *Tint* is any tone lighter than the standard. *Shade* is any tone darker than the standard. *Hue* is any color except the six standard colors; as orange red, would be a hue. *Primary* pigment colors include blue, red, and yellow; Spectrum primary, include red, green and violet. The ratio of color values, is blue 8 parts, red 5, and yellow 3. *Secondary* colors are green, formed by blue and yellow; orange, by red and yellow; violet, by red and blue. *Tertiary* colors include citrine, formed by orange and green; russett, by orange and violet; olive, by green and violet. *Neutral* colors are dulled colors; usually mixed with white, black or some other

color forming a gray. *Quality* is warm, when it contains red, and cold when it contains blue, and neutral, when containing white and black. *Harmony* is a pleasing arrangement of colors. There are six harmonies: Neutral, composed of black, white and gray; Contrasted, one color with neutrals; Dominant harmonies include tones of the same scale; Complementary, tones of opposite scales; Analogous, tones of related scales; Perfected, tones analogous or dominant. *Contrast* is a marked difference in color, and may be in hue, tone or quality. In combining several colors, the contrast should be gradual, or flowing from lighter to darker tones, or darker to lighter tones.

COLOR EFFECTS—Light tones enlarge the size, while dark tones reduce. Stripes lengthen the object. Tints are best suited for blondes, while shades are better for brunettes.

METHOD.—Teach pupils to recognize and select standard colors, and arrange the scales. Teach them to discriminate in tones, hues, tints, and shades, assigning each one to its proper place. Teach the harmonies and how to form them. Teach pupils to observe the clouds and other objects and discriminate the color. Use color chart and colored paper. In drawing follow the line of work suggested, using clay or paper pulp, which may be made by soaking paper and grinding it. Develop the type solids first, then their relative forms. Colored sticks may be used in developing ideas of lines and figures. Give three points, then drill.

LOCAL GOVERNMENT.

GOVERNMENT is the power by which communities are ruled; and the manner in which the power is exercised. The three functions of government are Legislative, or law making;—Executive, or law enforcing;—Judicial, or law interpreting.

CONSTITUTION is the expression of rights and duties—the fundamental organic law, or principle of government of a nation, state or any other social organization. *Preamble* is a statement of the purpose of a constitution. *Departments* are the separate functions. *Amendments* are the changes, modifications, or additions made in the constitution, as circumstances demand. A *Bill* is a proposed law, which after being approved by the legislative body, and signed by the chief executive, becomes a law. *Statute* law is a law made by the legislative body, and in harmony with the constitution. *Common* law is the custom of the community and governs in the absence of the statutory law. *Rights* include the relations between the citizens and the government. There are four groups: Industrial rights to support self and those dependent; Political rights of free speech; Social rights of free schools and other institutions. Religious

right to worship according to the dictates of conscience. The purpose of the government is to protect the rights of the people, promote their interest and to administer to their wants, and for these purposes it is divided into National, State, County and Township governments.

TOWNSHIP is the simplest division of government. It is a division of a county, bearing an individual name and independent in school, road and other local matters, under certain restrictions. *Officers—Board of Trustees*—three in number, one elected annually; Duties are to hold elections, levy tax, care for poor, act as Board of Health, fence viewers and equalization. They divide the townships into road districts, under the charge of a road supervisor, who requires all able-bodied men between the ages of 21 and 45, to work two days on the roads, or pay its equivalent. He serves two years and receives two dollars per day. *Clerk* is secretary of the board of trustees, reports to the auditor, serves two years and receives two dollars per day. *Assessor* lists all property not exempt, and persons subject to military duty, takes the census every five years, serves two years, and receives two dollars per day. *Justice* acts as a township court, keeps a docket, limited to county and \$100 suits; two to each township, serve two years and paid by fees. *Constable* serves any legal paper, from township officer, or any court; serves two years and paid by fees. *School Board* is composed of sub-directors, one from each sub-district, who is elected for three years. His duties are to take the enumeration annually in September, and report to the secretary of the board. He also employs teacher, provides fuel, visits the school, aids in governing and dismisses pupils by the approval of the president of the board. The officers of the school board are President, Secretary and Treasurer; whose duties are such as are usually required of such officers. The school board meet in March and September, or on call of the president. Their duties are to provide not less than six months school, levy taxes for school purposes, adopt text-books, make rules and regulations, fix teacher's wages and purchase apparatus and supplies. Members receive no pay. There are three forms of township organization: The District township, as above described; the Independent district, consisting of a board of three members, and the Independent township district, composed of three members the same as the Independent district. *Schools* are supported by a local tax not to exceed \$15 per pupil, for tuition, and \$5 for contingent and ten mills for school house. In addition to the local tax, a semi-annual apportionment is made of the interest on the permanent school fund, which amounts to near \$1.40 per pupil enumerated, which is distributed in proportion to the enumeration. *

TOWNS AND CITIES need more power because they must have more public conveniences; as walks, fire protection and preservation of order. The organization is similar to the township, composed of a council or law-making body, a Mayor, who enforces the laws and acts as a court;

a Clerk, Treasurer and Marshal. It is an Independent school district, having a board of six members. *Incorporated* town may be formed by twenty-five voters applying to the District Court. *City* of the second class must contain more than two thousand, and divided into wards, two councilmen from each, holding two years. Council elects marshal, police and attorney. *City* of the first class contains fifteen thousand, with one councilman from each ward and two at large who serve two years. All officers are chosen by the people for two years, except civil engineer, auditor, police judge and superintendent of markets, who are chosen by mayor and council. The township, town and wards are voting precincts.

COUNTY is a division of a state, usually twenty-four miles square, composed of sixteen townships. The county government has general oversight of such county matters as collection of taxes, opening roads, building bridges, recording deeds, looking after the poor, county buildings, schools, courts, etc. *Officials*—Board of Supervisors, three in number, one elected annually. They establish roads, issue orders on treasurer, allow claims, control and loan school fund, canvass election returns, equalize and levy taxes; serve three years; receive \$2.50 to \$4.00 per day and five cents mileage. *Auditor*—Secretary of the Board keeps minute book, highway record and warrant book; reports election returns to Auditor of State; also abstract of census; apportion jurors, makes tax list for Treasurer from Assessor's books; serves two years and receives \$1200 a year salary. *Treasurer* receives all monies belonging to the county, and pays out on the warrant of the Auditor; reports monthly to the State Auditor and twice each year to State Treasurer; serves two years, and salary not to exceed \$1500. *Superintendent* holds examinations, institutes, decides appeals, receives reports from teachers and secretaries, visits schools at his option, and has general oversight of school work; reports annually to State Superintendent; serves two years and receives \$4.00 per day. *Recorder* records deeds, mortgages, leases, articles of incorporation, town plats and power of attorney; serves two years; fees 50 cents, or ten cents per hundred words. *Clerk* of the court keeps record book, judgment docket, fee book, sale book, incumbrance book and appearance book; issues marriage licenses, keeps a record of births, deaths, subpoenas, witnesses, appoints guardians, administrators and probates wills; serves two years, salary, \$1100 to \$1500. *Sheriff* gives election notice, selects jurors, preserves the peace, arrests and confines criminals; term two years; salary \$200 and fees. *Attorney* acts for the state in the prosecution of criminals, interprets the law for county officials, serves two years, salary fixed by Board of Supervisors. *Surveyor* surveys and plats land and makes re-surveys; term two years; fee \$4 per day. *Coroner* holds inquests and reports to the court; acts as sheriff in case of a vacancy; term two years; receives \$5 per day and

mileage. Of the taxes collected annually 10 per cent goes to the State, about 30 per cent goes to the county and 60 per cent to the towns and townships.

STATE government has for its purpose the oversight of matters of general interest of the State; as state schools, asylums, prisons and the making of statutory laws, etc. The *Educational Institutions* include the *State University* at Iowa City, admitting high school graduates; also has departments of Law, Medicine and Dentistry; Supported by taxes and proceeds of a land fund. *State Normal School* at Cedar Falls receives students holding second class certificates free of tuition. It is supported by State appropriations. *Blind* asylum at Vinton, *Mute* asylum at Council Bluffs, and asylum for *Feeble-minded* children at Glenwood, receive and educate the unfortunate at county and state expense. The *Agricultural* college at Ames, gives instruction in branches related to agriculture and the mechanic arts. It is supported by State appropriations and land grants. *Reform* schools for boys at Eldora and for girls at Mitchellville, for the purpose of educating unruly boys and girls, is supported by State appropriation. *Orphans Home* at Davenport receives soldiers' orphans and educates them at the expense of the county from which they came. *Asylums* for the insane at Mt. Pleasant, Clarinda and Independence are controlled by the State, at the expense of the counties. *Penitentiaries* at Fort Madison and Anamosa receive criminals from district courts and confine them at hard labor for the term of their sentence. *Soldiers Home* at Marshalltown receives and furnishes a home for old soldiers, and recently provided cottages for a limited number of families.

STATE OFFICIALS.—General Assembly is composed of Senate of fifty members, elected for four years, and House of one hundred members elected for two years. Salary of both members is \$550 a session, which meets biennially. The duty of the Legislature is to appoint officers of State Institutions, make general laws for the state, and make state appropriations. *Bills*, or proposed laws are read three times in the House in which they originate, discussed, amended if necessary, and voted on; if passed they go through a similar process in the other House, then to the Governor for his signature, when it becomes a law; unless vetoed. Governor recommends legislation, approves bills, offer rewards for criminals, pardons criminals, calls out militia, and appoints subordinate officers. *Secretary of State* keeps legislative acts, records of incorporations, signs commissions, state lands and distributes state laws. *Auditor of State* settles all accounts with the State, draws warrants, apporitions the interest of the school fund, keeps a record of the reports of management of insurance companies, etc. *Treasurer of State* has charge of all monies due the State, and pays out on the warrant of the Auditor of State. *Executive Council* is composed of the Governor, Secretary,

Auditor and Treasurer and provide for taking the census once in ten years, canvass the votes from counties, equalize taxes between counties, and attend other matters. *State Superintendent* of Public Instruction receives reports from county superintendents, collects information in regard to schools, recommends needed legislation, hears appeals from county superintendents, publishes rulings, appoints institutes, furnishes questions for teachers' examinations, and holds annual meetings of county superintendents.

SALARIES.—Governor, \$3,000; Lieutenant Governor, \$1,100 a session; Secretary, Auditor, Treasurer, Superintendent, Clerk and Reporter of Supreme Court, \$2,200; Railroad Commissioner, \$3,000; Attorney General, Adjutant General, Commissioner of Labor Statistics, Custodian Public Property, Dairy Commissioner, Deputy State Officers, Governor's Secretary, \$1500; Fish Commissioner Librarian, Commissioner Immigration, \$1200; District Judges, \$2500.

COURTS examine violations of law, punish criminals, and adjust difficulties between citizens. Justices may give preliminary hearings and bind over to court unless the fine is less than \$100. The accused may demand a jury of six before a justice, who decides the guilt or innocence of the accused, the penalty being fixed by the justice. *Grand Juries* examine witnesses as to their knowledge of violation of law, and bring in indictments. *Trial juries* hear evidence and give opinion of guilt or award damages. Writ of Habeas Corpus is a petition for an immediate examination as to cause for arrest. *District Courts* are composed of several counties, and hold four sessions a year. They have from one to four judges, who are paid by the state, and hold office for four years. They try civil and criminal cases and appeals from justice's courts. *Supreme Court* consists of five judges, elected for six years. Two terms are held annually in Des Moines, Davenport, Dubuque and Council Bluffs. They decide appeals from district courts, correcting errors, grant rehearings and establish precedents.

The following subjects should be looked up and defined, in addition to the above facts: Liberty; A Right; A Duty; A Privilege; A Citizen; An Elector; Suffrage; A Corporation; Public Domain; Eminent Domain; Prohibition. License and Local Option; Habeas Corpus; Political Issue; Platform; Right of Petition; Repudiation.

The American idea is: "A government of the people, by the people, for the people," depending upon the virtue and intelligence of the common people.

NATIONAL GOVERNMENT.

FORMS of Government—Patriarchal, or family; Theocratic, by God; Monarchial, by a monarch, absolute or limited; Aristocratic, by nobles;

Democratic, by the people direct; Republican, by representatives of the people.

MAXIMS.—The government is for the good of the governed. Equal protection. No distinction of birth. Free speech. Intelligence the foundation of a Republic. Know the Constitution. Every citizen should vote. Voters should understand the issues. School houses are the forts of a Republic. Intelligence, a qualification for franchise.

CONSTITUTION.—PURPOSE.—1, To form a union; 2, To establish justice; 3, To insure domestic tranquility; 4, To provide common defense; 5, To promote the general welfare; 6, To secure liberty.

LEGISLATIVE BRANCH.—Senate—Two Senators from each State; *Elected* by the State Legislatures; *Term*, six years; *Qualifications*, resident of the State nine years, age thirty; *Salary*, \$5000; President of Senate, Vice President of United States. *Powers*, Confirm or reject nominations of the President; Ratify or reject treaties with foreign countries; Elect Vice-President when election fails; Act as court of impeachment of high public officers.

House.—Members, 365; *Elected* by the people of Congressional districts; *Term*, two years; *Qualifications*—Resident of State; Citizen of the United States seven years; Age twenty-five; *Salary*, \$5000. *Powers*—Elect Speaker and other officers, and President, if regular election fails; Prosecute impeachments before the Senate; Originate all bills for raising revenue.

Joint Powers—Each Congress lasts two years from the 4th of March of odd years. Regular annual session begins first Monday in December. Special session at the call of the President. Each House is judge of the qualifications of its own members. Congress has general power of legislation. 1, To regulate the conduct of the general business; 2, To provide for the raising and disbursement of revenue; 3, To borrow or coin money and regulate its value; 4, To regulate inter-state commerce; 5, To declare war, and provide for an army and navy; 6, To admit new states into the Union; 7, To provide for the government of the territories; 8, To enact patent and copyright laws; 9, To enact uniform naturalization and bankruptcy laws; 10, To establish post-offices and pass roads; 11, To provide for punishment of crimes against the United States; 12, To establish courts inferior to the Supreme Court; 13, To enact laws carrying into effect constitutional provisions.

ACTS become laws, by the written approval of the President; or by his neglect (pocket veto) for ten days; but Congress has power to pass a law over the President's veto, by a vote of two-thirds of each House.

EXECUTIVE BRANCH.—*Elected* by electors, chosen by the people; *Term*, four years; *Qualifications*—A natural born citizen; Age, thirty-five; Resident of the United States fourteen years; *Salary*, \$50,000; *Powers and Duties*—Commander-in-chief of the army and navy; Advises legislation

by message; Approves or disapproves acts of Congress; Makes treaties by the consent of the Senate; Appoints ministers, judges, heads of departments, by the consent of the Senate; Commissions all officers of the United States; Grants pardons for offences against the United States.

Vice President.—Elected by electors; Term and qualifications same as President; Cannot be chosen from the same State; Salary, \$8000; He acts as president of the Senate, and succeeds the President in case of death.

Executive Departments.—Secretary of State has charge of foreign and domestic relations. Secretary of Treasury has charge of the collection and disbursement of public moneys. Secretary of War has charge of the army and military affairs. Attorney General has charge of the legal department of the government. Secretary of Navy has charge of the navy and naval affairs. Secretary of Interior has charge of lands, pensions, patents and education. Secretary of Agriculture has charge of all agricultural affairs, weather bureau, etc. Cabinet members are appointed by the President and receive \$8000 salary.

JUDICIAL BRANCH—*Judges* are appointed by the President, approved by the Senate. *Term* during life or good behavior; but may be retired at the age of 70, having served ten years; Removed by impeachment. *Members:* Chief Justice and eight Associate Justices. *Salaries:* Chief, \$10,500; Associates, \$10,000. *Jurisdiction:* All cases affecting ambassadors; Controversies between States; Between States and foreign countries; Between citizens of a State and foreign State; Appellate jurisdiction from inferior U. S. Courts. *Inferior Courts* have jurisdiction in cases between citizens of different States; United States and a citizen; Cases of admiralty and maritime jurisdiction; All crimes against the United States; The trial must be by jury and held in the State where the crime was committed; U. S. Circuit courts are nine in number, held by a Circuit Judge, assisted by a Supreme Judge; Salary of Circuit Judge, \$6,000. *District Courts* are one or more in each State held by a District Judge, who receives a salary of \$3,000 to \$5,000.

Privileges.—Citizens of each State shall be entitled to all the privileges and immunities of the several States. A Republican form of government and protection against invasion, is guaranteed to each State.

Amendments may be made to the Constitution, when two-thirds of both Houses deem it necessary and propose amendments, which are afterward ratified by three-fourths of the State Legislatures. Amendments adopted: 1. Freedom of Religion. 2. Right to bear arms. 3. Prohibits quartering soldiers on citizens. 4. Prohibits unreasonable searches or seizures of private property. 5. No trial for crime without indictment, or be a witness against himself, or take property for public use, without just compensation. 6. Grants speedy trial by impartial jury and counsel for defense. 7. Grants trial by jury when controversy exceeds \$20.

8. Prohibits excessive bail, fines and cruel and unusual punishment. 9. The people retain inherent rights. 10. States have all powers not prohibited by the Constitution. 11. Judicial power shall not extend to cases between citizens and States. 12. Fixes manner of choosing Presidential electors. 13. Abolished slavery. 14. Defined citizenship fixes ratio of representatives, defined ineligibility of representatives, and declared the validity of the public debt. 15. Declared the right of suffrage to all without regard to color, race or previous condition of servitude.

Debt, Supremacy, Oath and Test: All debts contracted prior to the adoption of Constitution, shall be valid. The Constitution shall be the supreme law. All government officials shall take an oath before entering upon their official duties. No religious test shall be required as a qualification.

You should read up the following subjects in any good Cyclopaedia: Anarchy; Appeal; Apportionment; Army; Bankruptcy; Bills of Attainder; Credit; Revenues; Bill of rights; Bonds; Bureaus; Caucus; Convention; Census; Civil rights; Civil service; Coins; Coin certificate; Commerce; Commonwealth; Communism; Confederation; Constituency; Copyright; Crimes; Delegates; Diplomatic service; Emancipation Proclamation; Envoys; Ex-post facto law; Felony; Feudal System; Flag; Foreigners; Fractional currency; Freedom; Fundamental law; Gerrymander; Grand model; Homesteads; Impeachment; Inauguration; Judiciary; Labor hours; Legal tender; Legislature; Limitations; Lobby; Magna Charta; Mails; Mason Dixon's line; Militia; Mint; Money; Nation; Naturalization; Nihilism; Nullification; Oath; Ordinance; Parties; Politics; Platforms; Planks; Pensions; Polls; Repudiation; Revenue duties and internal; Rebellion; Secession; Slavery; Socialism; Sovereignty; Suffrage; Taxes; Treason; Treaty; Union; Veto; War; Wards; Wrongs.

BOOK KEEPING.

BOOK KEEPING is the science of accounts, or the science of debits and credits. A knowledge of this science is essential to business success. Business failures are caused generally from a lack of knowledge as to the condition of the business. No person should start in life without a fair knowledge of this science.

TERMS.—*Resources* comprise what we own or use in business; as Cash, Merchandise, Notes, Real Estate, Personal property and Personal accounts. *Liabilities* include what we owe; such as notes and accounts due others. *Capital Stock* or Net Capital is the difference between Resources and Liabilities. *Cash* is money or drafts. *Merchandise* includes all kinds of goods bought or sold. *Bills* are written statements of goods

sold or service rendered; *Receivable* when due us; *Payable* when due another. *Creditor* supplies goods. *Debtor* receives goods.

METHODS.—*Single Entry* considers only personal accounts. *Double Entry* considers everything that affects the business, and is a complete and exact science. *Single Entry* uses Day Book and Ledger; *Double Entry* uses Day Book, Journal and Ledger. *Day Book* contains the consecutive transactions of business. *Journal* is a copy of the Day Book arranged into debits and credits. *Ledger* contains a summary of debits and credits arranged under appropriate heads. Auxiliary books are *Cash Book*, which contains a record of receipts and disbursements of cash. *Bill Book*, which contains all the particulars of all notes and drafts issued or received. *Sales Book*, which contains a record of sales.

JOURNALIZING is transferring the account from the Day Book to the Journal. The Journal has two columns to the right for debiting and crediting, marked Dr. and Cr. Rules—1. Debit what comes in, and credit what goes out. 2. Debit loss, and credit gain. 3. Debit a party when he owes us, and credit when we owe him.

POSTING is transferring an account from the Journal to the Ledger. The debits and credits are arranged each to its own page in the Ledger. Debits are placed to the left side of the page, and credits to the right. *To* is used with debits, and *By* with credits. The Ledger shows the date, for what debited or credited, the Journal page and the value of the item.

PRINCIPLES.—1. Proprietors should be credited for investment, and debited when they draw from the business. 2. Cash should be debited when received, and credited when paid. 3. Bills Receivable should be debited when received, and credited when paid. 4. Bills Payable should be credited when issued, and debited when paid or redeemed. 5. Personal accounts should be debited when they owe, and credited when they pay. 6. Loss and Gain should be debited for all outlays or losses, and credited for all gains or profits.

STATEMENTS show the condition of the business by a *Trial Balance* to ascertain if the debits and credits are equal or balance. If the footings agree with the Journal footings, the work is correct. Rules: *Net Gain* equals the sum of gains less the sum of the losses; or capital at close, less capital at beginning. *Present Worth* equals Resources less the Liabilities.

A **SET** in Book keeping is a series or group of accounts, involving all of the principles or points usually met.

THE **ITEMIZED LEDGER** is now generally used by retail dealers, and is simply an itemized journal and requires much less work than a complete set of books. See "Bryant and Straton's Common School Book keeping" for further information.

In addition to the above, you should understand the following

terms: Assets; Assignee; Balance; Bankable; Bankrupt; Bond; Discount; Dividend; Endorse; Face; Firm; C. O. D. and F. O. B.; Insolvent Note; Negotiable; Payee; Payor; Panic; Receipt; Pro rata; Retail; Teller; Trade discount; Trade mark; Usury; Valid; Value received; Vouchers; Way bill, etc.

RHETORIC.

RHETORIC is the art of inventing and expressing thought most appropriately. *Value* of rhetoric lies in compelling us to think, to inquire, to reason, and to judge. It gives a command of the vocabulary and educates taste in literature.

INVENTION treats of finding thought for a single sentence and continued discourse. Thinking is discriminating in mental impressions and uniting ideas and forming thoughts. Invention treats of the formation and punctuation of sentences, paragraphs, analysis of subjects and the framework of a subject. (See grammar.)

PERSPICUITY treats of *Style* or manner in which thought is expressed, which includes the writer's individuality, clearness, and quality of expression, mastery of the subject, use of words, as to propriety and precision, arrangement and miscellaneous violations of perspicuity. Rule: Use simple words and those with propriety and precision; avoiding obsolete and slang terms, tautology, verbosity and redundancy.

IMAGERY treats of the relation or similarity existing between things, as expressed in figures of speech. *Simile* points a likeness between things, which in other respects are unlike; as "Their lives glide on like rivers." *Metaphor* is a transfer of a relation for a brief explanation; e. g., "The ship plows the sea." *Personification* is a figure of speech in which things are raised to a plane above or below their own; "Necessity is the mother of invention;" "The waves to sleep had gone." The *Apostrophe* addresses the absent as though present; "Flag of the brave, thy folds shall fly the sign of hope and triumph high." *Antithesis* is a figure in which words or sentiments are set opposit or in contrast; "The prodigal robs his heir; the miser robs himself." *Metonymy* is the use of one word for another, by some bond of likeness or unlikeness; "He addressed the chair;" "The bullet has given way to the ballot." *Synechdoche* is the name of a part indicating the whole; as "Fifty sail for fifty ships."

ENERGY is the force of expression or utterance of expression; or power to impress the mind or arouse the feelings. *Idiom* is the structural form peculiar to a language; as, Beside himself; got wind; took place; how do you do?; jumped to the conclusion; etc. *Dialects* are varieties of expression, found in different localities. *Proverbs* are pithy sayings full of wit and wisdom; as "A carpenter is known by his chips."

"Make hay while the sun shines." *Climax* is the arrangement of expressions in the order of their strength: "All that I have, and all that I am, and all that I hope to be, I give to thee." *Period* is a sentence composed of phrases or clauses, so arranged that the meaning is held in suspense until the close: "Though betrayed, deserted, disorganized, unprovided with resources, begirth with enemies, the noble city was no easy conquest." *Variety* is the opposit of uniformity and is that change in expression which pleases.

WIT is a style resulting from the union of seemingly unrelated ideas, producing surprise and pleasure: "'What I want,' said an orator, 'is common sense.'" 'Exactly,' replied his opponent." *Humor* is an expression which excites laughter. *Salire* is a species of wit, used to lash the follies and vices of men. *Ridicule* provokes laughter at its object and thus makes it contemptible. *Irony* is an insult in the guise of a compliment. *Parody* is a partial copy, in which the spirit of the piece is changed and lowered. *Pun* is a harmony in sound of words, but a difference in the sense. *Pathos* is that form of expression which brings tears: it is closely connected with humor.

ELEGANCE shows itself in grace and beauty of expression. First, the beauty in thought, which may be clothed in the beauty of expression. There must be euphony in words selected; and sentences must be smooth and flowing.

PRODUCTIONS.—*Oral Discourse* is by the mouth and is intended to move the will; as the sermon, lawyer's argument, the politician's harangue, and the statesman's debate. The intellect is the walls of the bank, the feelings the vault, the will the safe in the vault. *Conversation* is an oral discourse between two or more people. It widens our views and gives us better possession of our thoughts and teaches us how to communicate. *Debate* is a formal public conversation in which the opponents array all the facts and arguments to support his position and establish his propositions. *Burden of Proof* is the labor of proving that which exists to be false and the truth of the substitute. *Presumption* is the exemption from all labor in debate, save that of defence. *Oration* is a discourse delivered before an audience of scholars. The subject should be such as will arouse the thoughts and feelings of the speaker. The framework should consist of not more than two or three points. The treatment should be full of energy. The parts are the introduction, which should be honest and thorough; the conclusion, which is a recapitulation of the argument, making the application and fitly closing it. *Speeches* are oral discourses under various circumstances.

PROSE is written discourse including articles on science, history, travels and fiction. *Allegories* are species of fiction in which virtues and vices are personified. *Fables* are stories in which animals or things take the place of men in supposed doings, in which useful lessons are taught

Parables were discourses used by our Lord in the form of fables. *Letters* are written communications from one person to another. *Biography* is a written work describing one's life and character. *Autobiography* is a biography written by the subject of it. *Memoir* is a brief sketch of one's life and character. *Essay* is a short composition upon any subject.

POETRY is that division of discourse which is rythmical and metrical and is addressed to the feelings. *Rhythm* is that arrangement of words allowing the alternate stress and remission of the voice in reading, which should occur every two or three syllables regularly. *Foot* is the combination of two or three syllables, which requires a compound movement of the voice in reading. *Verse* is poetry, and a single line in poetry. *Stanza* is a group of several lines or verses. *Poem* is a collection of verses grouped into stanzas, written on some one topic. *Scansion* is the reading of poetry so as to make the rhythm. *Slurring* is running two or more syllables into one by dropping one or more letters. *Metre* is the quality of a poem determined by the number of feet in a regular verse; called dimeter, trimeter, tetrameter, pentameter and hexameter. *Rhyme* is the harmony in sound of the final syllables of verses. *Couplet* is two verses which rhyme. *Blank Verse* is without rhyme. *Didactic* poetry aims to teach; *Lyric* is to be sung; *Pastoral* deals with the objects of external nature; fields, springs, harvests and landscapes. *Epic* deals with the life of a hero; *Dramatic* is written to be acted; *Comedy* is light and humorous; *Tragedy* is earnest and serious, often fatal in the issues.

"Poetry ministers to that part of us which never changes. It is immortal. Poems grow richer and better by use; for every time we read them, the feeling, the sentiment, which floods the thought, is what preserves it. Poetry which haunts the memory is not only a joy forever, but is forever becoming more and more a joy."

"Read from the grand old masters,
Read from the bards sublime,
Whose distant footsteps echo
Through the corridors of time."

SCIENCE.

SCIENCE is accumulated and established knowledge, which has been systematized and formulated with reference to the discovery of general truth, or the operation of general laws. *Pure* science is the knowledge of laws, causes or powers, apart from their application. *Applied* science is a knowledge of facts, events or phenomena, accounted for by powers, causes or laws. *Art* is knowledge made efficient by skill. *Natural* sciences include Zoology, Botany, Geology, Physics and Chemistry.

ZOOLOGY is that branch of biology, which relates to the animal kingdom, including the structure, embryology, evolution, classification, habits and distribution of animals, both living and extinct. Animals grow, move, feel, live and die. *Branch* is a division of the animal kingdom with reference to the base of structure; as vertebrates, articulates, mollusks, radiates and protozoans. *Class* is a division of a branch with reference to mode of life and perpetuation; as mammals, birds, reptiles, batrachians. *Order* is a division of a class with reference to general form and food; as carnivorous and herbivorous orders. *Family* includes those animals whose mode of life, general form, kind of food are similar, as man, monkey and cat family. *Genus* is similar to family. *Species* is a division of a genus or family; as the white race, gorilla and lion.

VERTEBRATES include all animals having a backbone and brain. *Mammals* have warm blood and nourish their young with milk. *Man* is at the head of the animal kingdom; the only animal having the upright position and a perfect hand; speaks a language and laughs; has the largest brain, a mind and soul. *Monkeys* are four-handed animals. *Quadrupeds* are four-footed mammals, including the ox, horse, bear, cat, wolf, fox, dog, hog and various other families. *Carnivorous* mammals live on raw flesh; as the cat family. *Herbivorous* animals live on vegetable food. *Ruminants* chew the cud. *Whales* have warm blood and nourish their young with milk, and breathe through holes in the back part of the head. *Bats* have leather-like wings but no beak or feathers; body covered with hair; sleep in the day time and kill insects at night. *Insectivorous* animals include moles, hedge-hog and field-mouse; In cool regions they hibernate during the winter. *Rodents* or gnawers include beavers, rabbits, squirrels and rats. *Edentates* include the sloth, armadillo, and ant-eater, living in warm climates. *Marsupials* are animals having a pouch in which they keep their young in time of danger. Kangaroo of Australia and the opossum of America.

BIRDS are vertebrates, having warm blood, covered with feathers, adapted to flying, and a sharp bill instead of teeth, and two feet. *Raptors* or birds of prey, include hawks, vultures and owls. *Scansores* or climbers include the parrot toucan, cuckoo and wood-pecker. *Insesores* or perchers include humming bird, swallow, whippoorwill, thrush, lark, sparrow, crow, and many others. *Rasores* or scratchers include the dove family, pigeon, pheasant, partridge and others. *Grallatores* or waders include heron, stork, ostrich, snipe and others. *Natatores* or swimmers have web feet and include pelicans, gulls, dives, duck, goose and swan.

REPTILES have cold blood; covered with scales; lay eggs in holes or sand, which hatch without brooding. *Turtles* have a shell into which they can draw their head, feet and tail; live on land and in water. *Saurians* or lizards have long body and tail, no shell, large mouth, armed with teeth; they include lizards, mud puppies, alligators and

crocodiles, etc. *Serpents* are very long; have no feet but move by scales; swallow food whole. *Batrachians* have no scales; lay eggs in water; breathe first by gills, but when mature by lungs; include frogs, toads, etc.

FISH have cold blood; covered with scales; live in water; breathe by gills. They include the spined, as perch, mackerel and sword; soft-finned; as suckers, pike, pickerel, salmon, herring, cod and eels. Other species are puffers, tuft-gilled, sturgeon, shark and suckers.

ARTICULATES have no internal skeleton, the body being made up of a series of rings or articulations. They include insects and crustaceans. *Insects* have the body divided into head, thorax and abdomen; breathe through holes along the side, the air reaching all parts of the body. They are divided into bees, wasps, butterflies, moths, flies, beetles, bugs, grasshoppers, dragon flies, spiders and centipedes. *Crustaceans* are animals covered with a shell; live in water, except snails. *Decapods* or ten-footed, include crabs, lobsters and worms.

MOLLUSKS are composed of a soft body covered with a shell, which may be univalve, bivalve or multivalve. They include cephalopods, gastropods, accephalopods or oyster, muscles; brachiopods and polyzoans.

RADIATES have parts radiating from a center, composed of five parts or a multiple of five. They all live in the water; the best known is the star fish.

PROTOZOANS out number all other animals; as they are in every ditch, pond, lake, and every part of the sea. They have neither mouth nor stomach. They are small except sponges.

PLANTS.

PLANTS live, grow and die; but do not feel or move about. The three great classes are trees, shrubs and herbs. *Parts* are root, trunk, branches, leaves and flowers. Buds are the beginning of a branch or a flower. There are two kinds of roots; fleshy and fibrous. *Trunks* are composed of the pith, which does not increase in size; the wood formed in rings indicating the age. The wood hardens toward the center. The bark is the outside covering. *Exogens* are outside growers, by forming a new layer each year. *Endogens* are inside growers, as grass, palm and corn. *Monocotyledons* are plants with one seed leaf, and always inside growers. *Dicotyledons* have two seed leaves, and are outside growers. *Cotyledons* are the seed leaves. *Plumule* is the stem growing up from the cotyledons. *Radicle* is the root growing down. *Annuals* are plants maturing in a single season. *Biennials* require two years to mature from the seed. *Perennials* grow on from year to year. *Leaves* act as the stomach and lungs of plants. The parts are petiole or foot stalk, midvein and blade. Leaves are either parallel or netveined. *Flowers* are the organs of reproduction; composed of calyx, corolla, pistil and stamens. Sepals are the leaflets of the calyx; petals

are leaflets of the corolla. Pistil is divided into the stigma, style and ovary. Stamen is composed of the filament and anther, which contains the pollen.

CLASSIFICATION in Botany is the arrangement into groups by their resemblance in flowers, fruits and seeds. The two great divisions are *Phenogamous* or flowering plants; and *Cryptogamous* or flowerless plants. Class 1. *Exogens* or Dicotyledons. Sub class 1. *Angiosperms*, having a seed vessel and includes the polypetalons, monopetalons and apetalons division. Sub class 2. *Gymnosperms*, or naked seeded plants. Class 11. *Endogens* or monocotyledons, including the spadiceous, petaloideous and glumaceous divisions. Sub class 3. *Cryptogamous* or flowerless plants include *Acrogens* or ferns; *Anophytes* or mosses; and *Thallophytes* or sea weeds, mushrooms and lichens.

FRUIT is the developed ovary. They are simple fruits divided into fleshy, which includes Berry, Pepo and Pome; Stone fruits or Drupe; Dry fruits include grains, nuts, beans, etc.

FAMILIES are Crowfoot, Magnolia, Lily, Poppy, Cress, Violet, Pink, Mallow, Purslane, Linden, Flax, Geranium, Rue, Grape, Pulse, Rose, Gourd, Currant, Parsley, Honeysuckle, Heath, Figwort, Sage, Nightshade, Olive, Buckwheat, Walnut, Oak, Birch, Pine and others.

PLANTS live and grow by absorbing their food from the ground through the roots and carrying it to the leaves where it is digested by the sun, when it becomes sap and is then distributed to every part of the plant. The use of plants is to purify the air, by absorbing carbonic acid and giving out oxygen. They furnish food in the form of fruits and vegetables; clothing, in the form of cotton and flax; material for tools, utensils and buildings, and all the fuel in the form of coal and wood.

STONES.

STONES are conereted earthy or mineral matter. There are two kinds: those acted upon by acids, as chalk and marble, known as *calcareous* stones: and stones unaffected by acids; as clay, flint, pebble and agate: known as *silicious* stones. *Sandstone* is composed of grains of sand agglomerated, and may be calcareous or silicious; as whetstones. *Gypsum* or plaster is a stone unaffected by acids, and may be reduced to a powder by heat, known as Plaster of Paris. *Slate* is a silicious rock of a very fine grain and readily splits into layers. *Clay* is soft and easily moulded into any shape: acids have no effect on it. *Limestone* is a calcareous stone effected by acids, and reduced to a powder by heat. *Marl* is composed of calcareous matter and clay and is broken up by frost, forming with decayed vegetable matter a Vegetable Mold. *Crystals* have angles, edges and faces. There are crystals in both kind of stones but the siliceous are much harder than the calcareous. Crystals include quartz, rubies (red.) sapphires (blue), emeralds (green), topazes (yellow), amethysts (violet). *Diamond* is a crystal but not stone; it is pure carbon

or charcoal and will burn when the heat is strong enough. *Salt* is a crystalized mineral but not a stone. *Granite* is a stone composed of three crystals: quartz, felspar and mica. *Porphyries* are formed very much like granite, and look like fruit cake.

METAL is an elementary substance mixed with other materials, called ore, and generally located in veins or layers. The most common are iron, lead, tin, silver, gold and others.

COAL is the remains of vast forests, buried and changed by heat and pressure. Turf or Peat is a young coal bed.

IGNEOUS rocks have been formed by heat and fusion; as granite, porphyrites, basalts and lavas. They contain no fossils. *Aqueous* rocks have been deposited by water and contain fossils. They represent the different ages; as the Primary, Secondary, Tertiary and Quarternary.

PHYSICS.

PHYSICS is that science which treats of the laws and properties of matter, and the forces acting upon matter; as gravitation, heat, light, magnetism and electricity. *Experiment* is a test or trial to prove or disprove a proposition. Philosophical truths are verified by experiment. *Bodies* as to condition or state, are solid, as a pebble; liquid, as water; gaseous, as air. A body may pass through all the conditions or state, by the action of heat.

HEAT is a force which acts directly on the molecules of a body, causing *Evaporation* or "drying up;" *Ebullition* or boiling; *Distillation* or heating and cooling. *Expansion* is caused by heat, while contraction is caused by cooling. *Thermometer* is an instrument for measuring the temperature. Water boils at 212 degrees. in an open vessel, and cannot be made any hotter; but may be raised much higher in a boiler, producing steam of great power.

LIGHT is that force or motion by which objects are rendered visible; travels at the rate of 185,157 miles per second. *Reflection* is the throwing back of the rays, as from a mirror. *Refraction* is the bending of rays in passing through bodies of different densities. *Lenses* are glasses with one or both sides concave or convex, making objects appear larger or smaller, as shown in microscopes and telescopes. *Dispersion* is the breaking up of a ray of light, which is white, into the seven colors called spectrum colors. Color is the property of a body breaking up light and absorbing and reflecting parts.

SOUND is a sensation made on the ear by the vibrations of some body. It travels at the rate of 1,125 feet per second, through the air in all directions. The more dense the medium, the faster sound is transmitted. *Echo* is reflected sound. The pitch of sound depends upon the rate of vibration. Tones on musical instruments are changed by changing the length of instrument in opening and closing holes or shortening strings.

ELECTRICITY is a force moving in a circuit. *Voltaic* electricity is produced from a battery. *Frictional* electricity is produced by friction and will attract and repel light objects. Law: Two bodies charged with like electricity repel; with different electricity they attract. *Conductor* is a body over which electricity will pass; as metals, water and wet bodies. Electricity tends toward the point of a body. *Induction* is charging another body with electricity without direct contact. *Lightning* is electricity passing from one cloud to another; or from a cloud to the earth. Electricity is used in the telegraph, telephone, electric light and many other uses.

MAGNET is a piece of iron possessing the property of attracting other pieces of iron. There are two poles to the magnet. Like poles repel while unlike poles attract.

GRAVITATION is a force possessed by all bodies in proportion to the quantity of matter each contains, which attracts all bodies toward each other. *Weight* is the measured force of gravitation. *Density* is the amount of matter in a given space; or the degree of closeness of particles; taking water as the standard. *Pressure* is the force exerted by liquids and gases, depending on the height of the column.

CHEMISTRY.

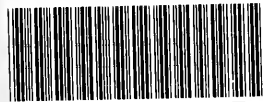
CHEMISTRY treats of the changes in the composition and constitution of the molecules of a body. *Compound* bodies are those composed of simple bodies combined: as air, water, salt, chalk, etc. *Simple* bodies are those which cannot be decomposed; as metals, mercury and gases; seventy in all. *Element* is a simple body. *Decomposition* is separating a body into its elements; as water into oxygen and hydrogen. *Combination* is a uniting in definite quantities, forming a body; as 1 part oxygen to 2 parts hydrogen, forming water. *Mixture* is a mingling of different elements in irregular proportions, which does not form a compound. *Air* is a mixture of oxygen and hydrogen, (1 to 4) but does not form a compound. *Gas* is an invisible fluid, very light; as hydrogen, which is inflammable; oxygen, which keeps up combustion; nitrogen, which is destructive to life; *Carbon*, which is found in all vegetable and animal formation, combined with oxygen and hydrogen. *Carbon Oxide* is formed by combining charcoal with oxygen; it is very poisonous. *Carbonic Acid* is a gas formed by carbon and oxygen; with lime added, forms carbonate of lime. *Oxides* are combinations of oxygen, with a metal; as lime, potash, soda and magnesia. *Acids* are compounds of oxygen with non-metallic bodies. *Salts* are compounds of acids and a base; as chalk is a salt composed of carbonic acid and oxide of calcium. *Molecule* is the smallest group of atoms that can exist in a free state, possessing the properties of the body, of which it is a part. *Atom* is the smallest division of a molecule. A molecule of water is composed of one atom of oxygen and two atoms of hydrogen.







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